Rx TYPE 294561/1 D.O.T. APP. 104264119
SERIAL 1204 CAT. NO. F10FMRX-V
CRYSTAL OVEN CATHODEON TYPE MCO-2332 TEMP 10°C VOLTS 6/12
Tx TYPE 284951/3 D.O.T. APP 104264120
SERIAL 1204 CAT. NO. F60FM-V R.F. OUT. 50W
DEVIATION 15KCS

PYE FIXED STATION

V.H.F. F.M.

RADIOTELEPHONE

Type F 60 FM

This service manual is for the maintenance of Pye Telecommunications equipment. The performance figures quoted are typical and are subject to normal manufacturing and service tolerances.

The right is reserved to alter the equipment described in this manual in the light of future technical development.

SERVICE MANUAL

ISSUE 3 (MAY 1965)

PYE TELECOMMUNICATIONS LIMITED · CAMBRIDGE · ENGLAND

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COMPONENT CODING

Components in each sub-section of the receiver unit can be identified from the block reference numbers as follows:-

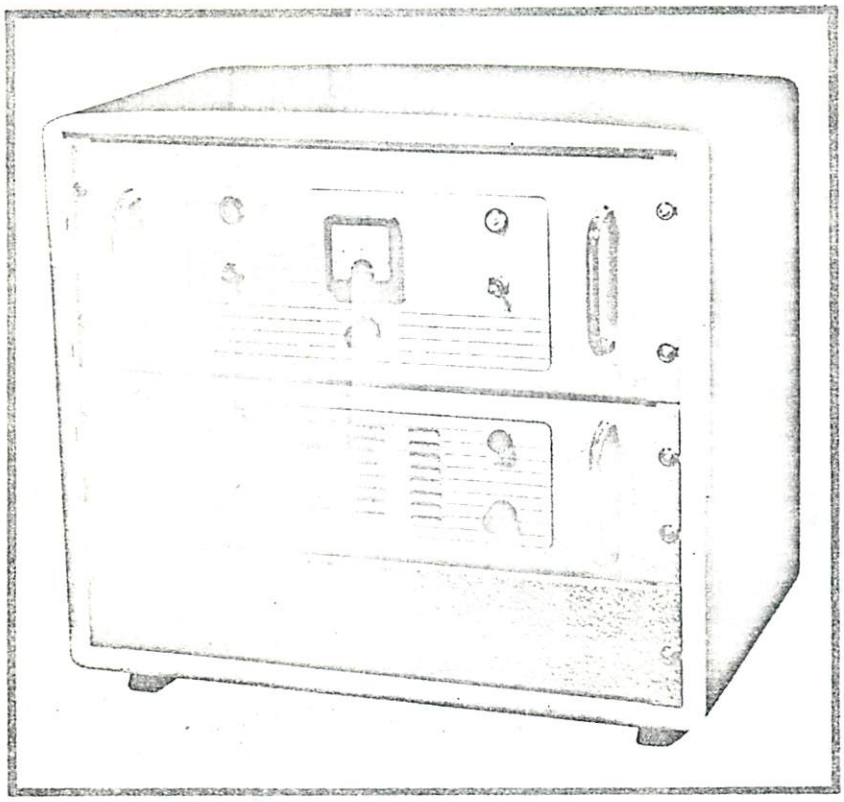
R.F. Unit Section	1-100
First I.F. Unit Section	101-200
Second Mixer Unit Section	201-300
Second I.F. Unit Section	301-400
Squelch Unit Section	401-500
Audio Unit Section	501-600
Squelch Relay Driver Unit Section	601-700
Audio Section	701-800
Components not covered in the above sub-sections	801-900

Components in the transmitter and transmitter power supply unit may be identified from the prefix numbers allocated as follows:-

Prefix	Chassis
1	Transmitter Unit
2	Transmitter power supply unit and front panel

CHAPTER I

GENERAL DESCRIPTION AND SUMMARY OF DATA



The Pye Fixed Station Type F60FM is a frequency modulated radiotelephone which operates on fixed frequencies between 25 and 174 Mc/s with a channel spacing of 25 or 50 kc/s. It comprises the transmitter Type PTC 3831/2X and the receiver Type FM 10 FRX and is intended for installation as a base station for land mobile schemes or for marine use.

The fully transistorised double superheterodyne receiver incorporates a squelch circuit to eliminate background noise in the absence of a signal. Channel spacing of 25 or 50 kc/s is determined by an interchangeable band pass block filter.

The transmitter provides a nominal r.f. power output of 60 watts, which can be reduced to 25 watts if required by a simple adjustment. For marine use the transmitter is set for a power output of 25 watts which can be reduced to 0.5 watt by operating a switch on the front panel.

The fixed station can be operated locally, or with extended control to a distance of 500 feet by using a Pye Radiotelephone Controller Type PT RTC (E) and Extension Control Panel Type PT ECP. Remote Control of the F60FM over telephone lines is possible, using the Pye Radiotelephone Controller Type PT RTC and Remote Control Panel Type PT RCP.

The equipment is suitable for operation in a wide range of climatic conditions and is designed to meet all relevant specifications.

SUMMARY OF DATA

GENERAL

Service	F3 Single or two frequency simplex A duplex version is available
Frequency range	25-174 Mc/s
Frequency bands	Band J 25-32.5 Mc/s Band H 32.5-42 Mc/s Band G 42 - 54 Mc/s Band F 54 - 68 Mc/s Band E 68 - 88 Mc/s Band D 88 -108 Mc/s Band C 108-132 Mc/s Band B 132-156 Mc/s Band A 148-174 Mc/s Band P 79 -101 Mc/s
Channel spacing (Standard) (Marine)	25 or 50 kc/s 50 kc/s only
Power requirements	100-150 volts a.c.) 50 or 60 c/s or) 190-240 volts a.c.)
Power consumption	Receiver 13VA Transmitter 264VA Transmit 57VA Standby
Dimensions	Complete station in cabinet:- $20\frac{1}{4}$ in. wide x $13\frac{1}{2}$ in. deep x 18 in. high (51.5 cm x 34.3 cm x 45.8 cm) Receiver panel:- $5\frac{1}{4}$ in. high x 19 in. wide (13.3 cm x 48.2 cm) Transmitter panel:- 7 in. high x 19 in. wide (17.8 cm x 48.2 cm)
Weight	Complete station in cabinet:- 83 lb (35.5 kg) Receiver complete with power supply unit:- 16 lb (7.2 kg) Transmitter complete with power supply unit:- 36 lb (16.5 kg)

RECEIVER	Type FM 10 FRX
Antenna impedance	50Ω nominal
Antenna connector	83 U.H.F. socket (SO259)
Sensitivity	0.5μV p.d. input for 20 dB quieting
Audio output	1W into the loudspeaker 40mW into the 600Ω line
Intermediate frequencies	First i.f. 10.7 Mc/s (6 Mc/s for 25-68 Mc/s equipment) Second i.f. 455 kc/s with band pass block filter
Squelch	The squelch circuit can be adjusted to operate with signal inputs between 0.25μV and 2μV p.d.

TRANSMITTER	Type PTC 3831/2X	
Antenna impedance	50Ω nominal	
Antenna connector	83 U.H.F. socket (SO259)	
R.F. output	60 watts (can be reduced to 25 watts) nominal depending on operating frequency.	
Rating	Intermittent (E.I.A.) up to 60°C ambient temperature.	
Modulation	Phase modulation. Adjustable up to 15 kc/s peak deviation (normally adjusted for 5 kc/s for 20/25/30 kc/s channel spacing or 15 kc/s for 40/50/60 kc/s channel spacing).	
Modulation sensitivity	Microphone	Approximately 8mV for 50% of the required peak deviation
	600Ω	Approximately -20 dbm for 50% of the required peak deviation.

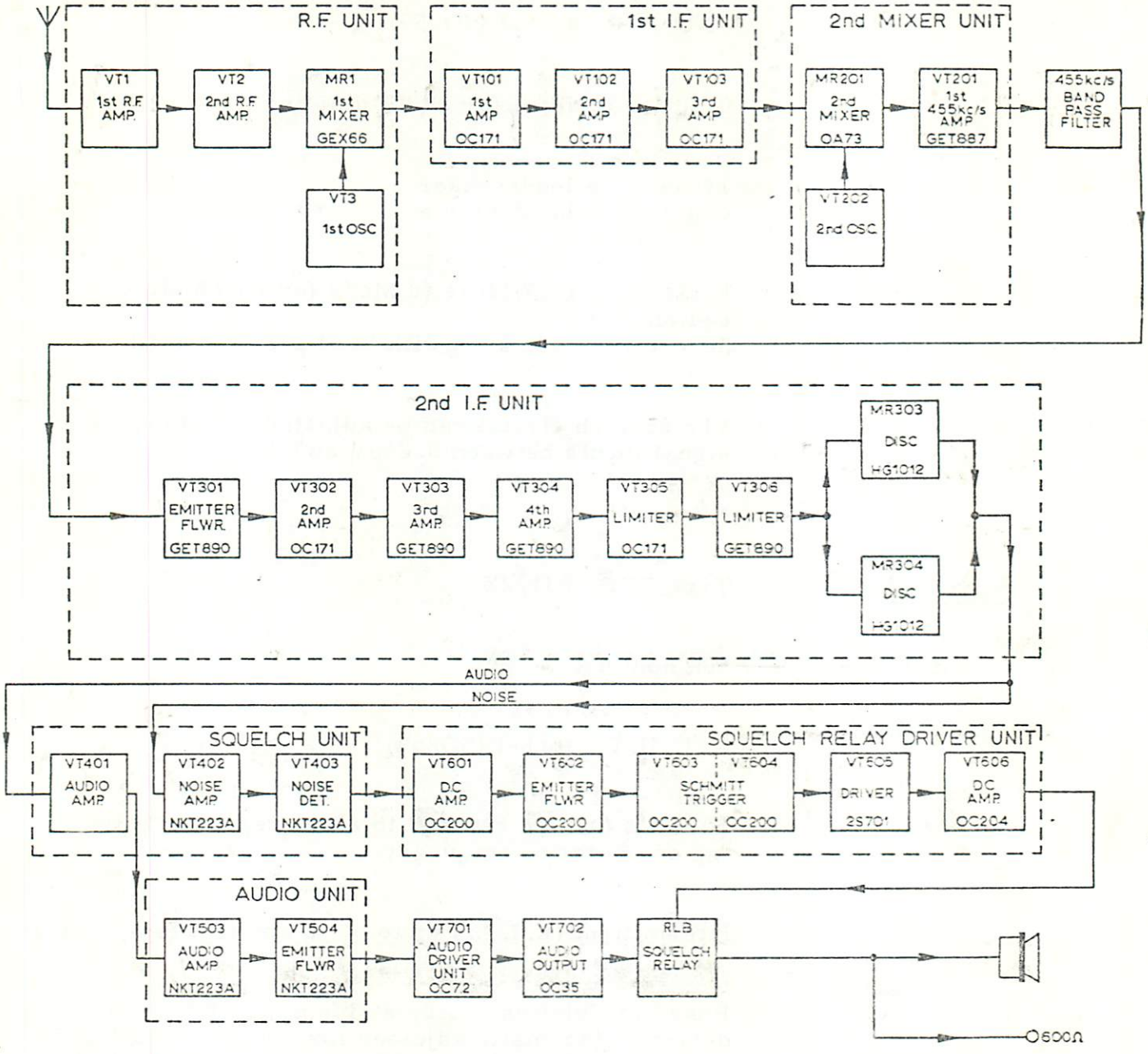


Fig 1. Receiver Block Diagram

CHAPTER II

TECHNICAL DESCRIPTION

RECEIVER OUTLINE DESCRIPTION

Fig. 1

The receiver uses 27 transistors in a double superheterodyne circuit. The output from two r.f. amplifiers is mixed with that of the first local oscillator to produce the first i.f. This is passed through a three stage amplifier and mixed with the second local oscillator output. The second i.f. is amplified by a single stage and passed through a band pass block filter to a three stage amplifier which is followed by a two stage limiter. A Foster-Seeley phase discriminator is used, the audio output of which is applied to the a.f. amplifier.

The equipment is fitted with a relay squelch which silences the receiver in the absence of a signal. A spare set of contacts on this relay are provided for external switching.

RECEIVER CIRCUIT DESCRIPTION

NOTE: To simplify servicing and to reduce the number of spares required to maintain a complete Pye system, common printed circuit boards are used wherever possible in all Pye radiotelephone equipments. For this reason, certain components fitted to printed boards are not required in this receiver and are shown shorted out on the Receiver Diagram Fig. 14.

R.F. and I.F. Circuits

Figs. 12 & 14

The antenna is matched into the R.F. Unit by capacitors C1 and C2 which form part of the antenna tuned circuit. The R.F. Unit comprises two r.f. amplifiers VT1 and VT2, the first diode mixer MR1 and the first oscillator VT3 which are mounted on a printed circuit board. A different board is used for each frequency band.

VT3 is an overtone crystal-controlled oscillator which operates at the signal frequency plus the i.f. for 25-32.5 Mc/s equipments and at the signal frequency less the i.f. for 32.5-174 Mc/s equipments.

In 25-54 Mc/s equipments the fundamental crystal frequency is developed across R17, the collector load of VT3, and mixed with the signal by MR1 to produce the first i.f. of 6 Mc/s.

In 54-174 Mc/s equipments, a harmonic of the crystal frequency is selected by the VT3 collector load and mixed with the signal frequency by MR1 to produce the first i.f. of 6 Mc/s for 54-68 Mc/s equipments or 10.7 Mc/s for 68-174 Mc/s equipments.

The collector loads and multiplication factors of VT3 for each frequency band are as follows:-

Signal Frequency		VT3 Multiplication	VT3 Collector Load
Band J	25-32.5 Mc/s	x1	R17
Band H	32.5-42 Mc/s	x1	R17
Band G	42 - 54 Mc/s	x1	R17
Band F	54 - 68 Mc/s	x2	T2
Band E	68 - 88 Mc/s	x2	L9
Band D	88 -108 Mc/s	x3	T2
Band C	108-132 Mc/s	x3	T2
Band B	132-156 Mc/s	x3	T2
Band A	148-174 Mc/s	x3	L9
Band P	79 -101 Mc/s	x3	L9

The first i.f. amplifier stages VT101, VT102, VT103 are mounted on a printed circuit board and different boards are used for the 6 Mc/s and 10.7 Mc/s first i.f.

The second local oscillator is crystal controlled. Its output is mixed with the first i.f. by MR201 to produce the second i.f. of 455 kc/s. The second local oscillator crystal frequency may be 455 kc/s either above or below the first i.f. according to the carrier frequency coverage of the equipment. Full details of the variations are given under CRYSTAL INFORMATION on page 8.

The second i.f. signal from MR201 is amplified by VT201 and is then applied to the band pass block filter, which determines the selectivity of the receiver for either 25 kc/s or 50 kc/s channel spacing. To alter the channel spacing of the receiver it is only necessary to change this filter, R332 and R339 on the 2nd I.F. Unit and the first oscillator crystal as described in Chapter IV, Section II.

The filter is matched into the Second I.F. Unit by the emitter follower VT301, and the 455 kc/s signal is further amplified by VT302-VT304; MR301 and MR302 act as limiters under high signal conditions.

The amplified output from VT304 is passed through the limiter stages VT305 and VT306 to the Foster-Seeley phase discriminator MR303 and MR304.

The test points in the collector circuit of VT303 and at the cathodes of MR303 and MR304, enable a diode probe to be connected for alignment purposes.

Squelch Circuit

The squelch circuit operates from the noise output of the discriminator and is basically a Schmitt trigger (VT603, VT604) which controls the squelch relay RLB. The noise is amplified by VT402 and detected by VT403, the d.c. output of which is amplified by VT601 to provide sufficient controlling bias for the Schmitt trigger via the emitter follower VT602. VT605 and VT606 provide the necessary drive to energise RLB when these transistors conduct.

With no incoming signal the rectified noise output from VT403 causes VT602 and VT603 to conduct. VT601, VT604, VT605 and VT606 are biased back and RLB is de-energised.

On receipt of a signal VT602 and VT603 are biased back causing VT604 to rapidly switch over to the conducting condition; VT605 and VT606 also conduct to energise RLB.

The SQUELCH control RV2 on the front panel determines the signal level at which the circuit will operate.

When RLB is energised, contacts RLB1 connect the audio output to terminals J, K and L of TS3. Contacts RLB2 are connected to terminals A, B and C of TS3 to provided switching for external facilities.

Audio Circuit

The audio output from the discriminator is amplified by VT401, VT503 and VT701 to drive the audio output stage VT702.

C509, L502, C513 form a low pass filter which is matched into the Audio Driver Unit by the emitter follower VT504.

Receivers intended for marine operation have an audio response which differs from that of land receivers. The band pass block filter is changed (see Parts Lists) and the audio circuit is modified as follows:-

(a) The value of C404 is changed (see Parts Lists) and C405 is connected across R405 as shown in Fig. 14.

(b) C517 and R519 are connected in parallel across L502 as shown in Fig. 14.

Bias for VT702 is provided by R707 and the preset potentiometer RV701, which should be set for a collector current of 190mA. Feedback from the output transformer T702 is applied to the base of VT701 via R705.

The output transformer T702 provides a 3Ω output at TS3 terminal L via the squelch relay contacts RLB1. To simulate the audio output load in the no signal condition, R709 is connected across the secondary winding of T702 by RLB1. T703 provides the 600Ω audio output at TS3 terminals J and K.

The switched attenuator VOLUME control is connected between the loudspeaker and TS3 terminal M which is normally connected by a link to the 3Ω output at TS3 terminal L.

Receiver Power Supplies

The receiver supplies are obtained from a conventional circuit and the three secondary windings of T801 provide the following outputs:-

Winding	Output
9-10	After rectification, 50V to energise RLA
11-12	After rectification, 14V for receiver supply
13-14	12.6V for ILP801 and crystal oven

Contacts RLA1 & 2 close when RLA is energised to connect the 14V receiver supply; RLA is energised by grounding terminal G of TS3.

The rating of the supply fuse is dependent on the supply voltage and whether or not a crystal oven is fitted (see Parts Lists). When two ovens are fitted an additional transformer T802 is required as shown in Fig. 14.

RECEIVER CRYSTAL INFORMATION

First Local Oscillator

Carrier Frequency (fc)	Crystal Frequency (fx)	Crystal Specification No. 50 kc/s	Crystal Specification No. 25 kc/s
25-32.5 Mc/s	$fx = fc + 6$	P29/C	P29/C
32.5-42 Mc/s	$fx = fc - 6$	P29/C	P29/C
42 - 54 Mc/s	$fx = fc - 6$	P29/C	P29/C
54 - 68 Mc/s	$fx = \frac{fc - 6}{2}$	P29/C	P29/C
68 - 88 Mc/s	$fx = \frac{fc - 10.7}{2}$	P29/C	P27/C*
88 -108 Mc/s	$fx = \frac{fc - 10.7}{3}$	P29/C	P27/C*
108-132 Mc/s	$fx = \frac{fc - 10.7}{3}$	P29/C	P27/C*
132-156 Mc/s	$fx = \frac{fc - 10.7}{3}$	P29/C	P27/C*
148-174 Mc/s	$fx = \frac{fc - 10.7}{3}$	P29/C	P27/C*
79 -101 Mc/s	$fx = \frac{fc - 10.7}{3}$	P29/C	P27/C*

* Indicates oven control is required.

Second Local Oscillator

Crystal Specification No. P53J

On 25-68 Mc/s equipment the crystal frequency is 6.455 Mc/s, except when the assigned frequency is within 100 kc/s of the following frequencies, in which case the crystal frequency is 5.545 Mc/s.

25.82 Mc/s	32.275 Mc/s	38.73 Mc/s	45.185 Mc/s
51.64 Mc/s	58.095 Mc/s	64.55 Mc/s	

On 68-156 Mc/s equipment the crystal frequency is 11.155 Mc/s, except when the assigned frequency is within 100 kc/s of the following frequencies, in which case the crystal frequency is 10.245 Mc/s.

78.085 Mc/s	89.24 Mc/s	100.395 Mc/s	111.55 Mc/s	122.705 Mc/s
133.86 Mc/s	145.015 Mc/s	156.17 Mc/s	167.325 Mc/s	

On 79-101 Mc/s and 148-174 Mc/s equipment the crystal frequency is 10.245 Mc/s except when the assigned frequency is within 100 kc/s of the following frequencies in which case the crystal frequency is 11.155 Mc/s.

81.960 Mc/s	92.205 Mc/s
153.675 Mc/s	163.920 Mc/s

Switched Channel Receivers

To avoid heterodynes on some switched channel receivers, the frequency of the second local oscillator may lie within the following limits:-

6.455 Mc/s ±3 kc/s)	25-68 Mc/s	11.155 Mc/s ±3 kc/s)	68-174 Mc/s
5.545 Mc/s ±3 kc/s)	equipment	10.245 Mc/s ±3 kc/s)	equipment

Should it be necessary to order a replacement crystal it is essential to quote the exact frequency of the original crystal. Use of a crystal of any other frequency may result in heterodynes on one or more channels.

TRANSMITTER OUTLINE DESCRIPTION

Fig. 2

In the r.f. section, one section of a double triode operates as a crystal-controlled oscillator and the second section functions as a phase modulator. In 25-68 Mc/s equipment the modulated output is passed through a three stage multiplier comprising a pentode and a double beam tetrode. In 68-174 Mc/s equipment the modulated output is passed through a pentode buffer stage to a four stage multiplier comprising two pentodes and a double beam tetrode. The final multiplier drives a double beam tetrode power amplifier stage, which operates in a push-pull circuit.

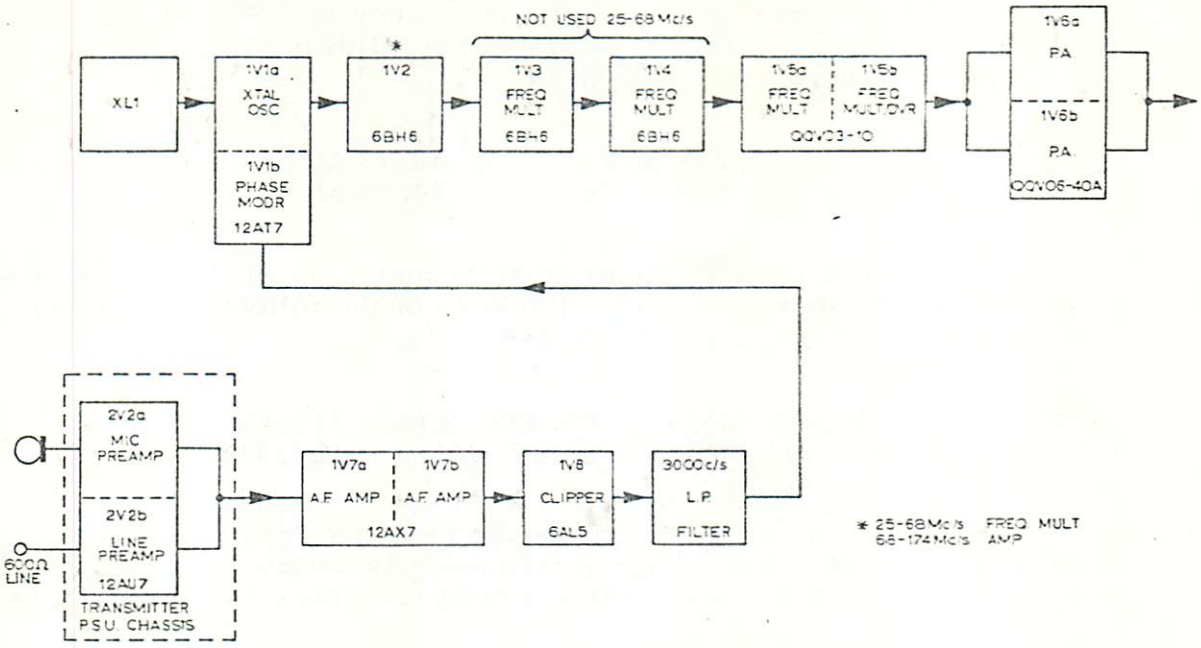


Fig. 2 Transmitter Block Diagram

In the a.f. section, the output from a line/microphone amplifier (in the transmitter power supply unit) is amplified by two audio stages, the output of which is passed through a double diode clipper and a 3000 c/s low pass filter to the phase modulator.

TRANSMITTER CIRCUIT DESCRIPTION

R.F. Stages

Fig. 16 & 18

The triode 1V1a operates as a cathode-coupled crystal controlled oscillator at fundamental crystal frequency. Separate crystals are used in switched channel equipments and capacitive trimming is provided by 1C1-1C6. The second triode 1V1b is the phase modulator and the output from the oscillator 1V1a is applied to the grid of this stage via 1C16. The audio output from the a.f. section is also applied to the grid of 1V1b via the deviation control 1RV5. The modulated output is developed across 1L2 and applied to 1V2 via 1C20.

The pentode 1V2 functions as the first multiplier stage for 25-68 Mc/s equipments or as the buffer/amplifier stage for 68-174 Mc/s equipments. The test point TP in the anode circuit of 1V2 enables a frequency meter to be connected when the oscillator is aligned. The output from 1V2 is applied via 1C28 to 1V5a for 25-68 Mc/s equipments or to 1V3 for 68-174 Mc/s equipments.

In 68-174 Mc/s equipments 1V3 and 1V4 function as the first and second multiplier stages with 1L4 and 1T1 tuned to the crystal frequency multiple given below.

One section of the double beam tetrode 1V5a operates as the second multiplier for 25-68 Mc/s equipments or as the third multiplier for 68-174 Mc/s. equipments. The second section 1V5b operates as the final multiplier and as the driver for the power amplifier stage 1V6.

The multiplication factors of 1V2-1V5 for each frequency band are as follows:-

Carrier Frequency	V2	V3	V4	V5a	V5b	Total Multiplication
25-32.5 Mc/s	x2	-	-	x3	x2	x12
32.5-42 Mc/s	x2	-	-	x3	x2	x12
42 - 54 Mc/s	x2	-	-	x3	x2	x12
54 - 68 Mc/s	x2	-	-	x3	x2	x12
68 - 88 Mc/s	x1	x2	x2	x3	x2	x24
88 -108 Mc/s	x1	x2	x2	x3	x2	x24
108-132 Mc/s	x1	x2	x2	x3	x2	x24
132-156 Mc/s	x1	x2	x3	x3	x2	x36
148-174 Mc/s	x1	x2	x3	x3	x2	x36
79-101 Mc/s	x1	x2	x2	x3	x2	x24

Grid bias for the multiplier stages is provided by 1R8, 1R12, 1R16, 1R20 and 1R24, and the meter shunts 1R9, 1R13, 1R17, 1R21 and 1R25 enable the multiplier grid current readings to be taken on the front panel meter 2M1.

The power amplifier 1V6 is a double beam tetrode operating in push-pull. Fixed bias for both grids is provided by the power supply unit and is applied to the centre tap of 1L6. The meter shunt 1R28 enables the p.a. grid current to be read on 2M1.

Screen voltage for both sections of 1V6 is provided by a potential divider comprising 1R30 and either 1R31 or 1R53. For 60W operation a shorting link is connected across 1R31, and 230V is applied to the screens. For 25W operation a reduced supply of 130V is applied to the screens by connecting the shorting link across 1R53. Contacts of the LP-OFF-HP switch 2SK are connected across 1R33, and apply a short circuit across this resistor when the switch is in the H.P. position. With 2SK in the L.P. position, the short circuit is removed from 1R33 and the reduced screen voltage protects the p.a. stage when the multiplier and driver stages are aligned. The LP. position can also be used to provide a low power output for marine equipments.

The antenna coupling coil 1L9 is series tuned by 1C66 and the amount of coupling between 1L8 and 1L9 is varied by an adjusting screw.

The coil of the antenna changeover relay 1RLD is connected in series with the h.t. supply to the transmitter r.f. stages, and ensures that the antenna is automatically connected to the transmitter when h.t. is applied.

Modulator stages

The double triode 2V1 is mounted on the transmitter power supply chassis. Input from the microphone is applied to the grid of 2V1a via the microphone gain control 2RV1. If a Radiotelephone Controller is used for remote control, input from the lines is applied to the grid of 2V1b via the line gain control 2RV2; thus both inputs can be separately controlled.

The output from 2V1 is coupled by 2C16 to one section of the double triode 1V7 on the transmitter chassis. The double diode 1V8 operates in a clipper circuit which limits the peak modulation voltage. The output from the cathode of 1V8b is taken through the 3000 c/s low pass filter to the phase modulator 1V1b. 1RV5 is set to provide the required peak deviation of the system in which the transmitter is used.

Transmitter Power Supplies Fig. 20

2MR2 provides h.t. for the transmitter exciter and audio stages via the pi-section filter 2C6a, 2L1, 2C6b. A reduced h.t. is applied to the line-microphone amplifier 2V1 via 2R21, and further smoothing is provided by 2C12a, 2R20, 2C12b. Fixed bias for the power amplifier 1V6 is developed across 2R2 and smoothed by 2C1.

2MR3 provides h.t. for the power amplifier stage 1V6, and is supplied with an input of 550V for 60W operation or 380V for 25W operation, depending on the selected voltage tap of 2T1 secondary winding. 2R16, 2R17 and 2R24, 2R25 equalise the voltage drop across the series connected smoothing capacitors 2C7, 2C8 and 2C10, 2C11.

The silicon diodes 2MR4 and 2MR5 prevent negative-going transients of high amplitude occuring at the instant of switching from transmit to receive.

The output from the 50V winding of 2T1 is rectified by 2MR1 to provide the energising potential for the h.t. relay 2RLA. Spark suppression for the relay contacts 2RLA2 and 2RLA3 is effected by 2C14, 2R22 and 2C15, 2R23.

Transmitter Switches and Relays

(a) 2 SK LP-OFF-HP switch - one pole operates as the power off/on switch and is connected between the input fuse 2FS1 and the appropriate voltage tap of 2TS2. The second pole of this switch is connected across 1R33 and when 2SK is in the LP position, the power output of the transmitter is reduced as described on page 11.

(b) 2 SL TRANSMIT switch - In the TRANSMIT position, 2SL completes the ground connection to 2RLA which is energised by the 50V supply. The microphone or telephone handset press-to-talk switch is connected in a series-parallel configuration with 2SL and operates 2RLA in the same way as 2SL.

The contacts of 2RLA connect the following supplies:-

2RLA1 - reduced h.t. from 2MR2 to the anode of 2V1
2RLA2 - h.t. supply from 2MR2 to the transmitter exciter and audio stages.
2RLA3 - h.t. from 2MR3 to the anodes of the p.a. stage 1V6.

(c) 2SJ METER SWITCH - a five position switch which enables the following transmitter readings to be made:-

Position	Indication
1 (25- 68 Mc/s)	Not used
1 (68-174 Mc/s)	Combined grid currents 1V2 & 1V3
2 (25- 68 Mc/s)	Combined grid currents 1V2, 1V5a & 1V5b
2 (68-174 Mc/s)	Combined grid currents 1V4, 1V5a & 1V5b
3	Grid current 1V6
4	Anode current 1V6
5	Not used

TRANSMITTER CRYSTAL INFORMATION

Carrier Frequency (fc)	Crystal Frequency (fx)	Crystal Specification No.	
		50 kc/s	25 kc/s
25-32.5 Mc/s	$fx = \frac{fc}{12}$ Mc/s	P18	P18
32.5-42 Mc/s	$fx = \frac{fc}{12}$ Mc/s	P18	P18
42 - 54 Mc/s	$fx = \frac{fc}{12}$ Mc/s	P18	P18
54 - 68 Mc/s	$fx = \frac{fc}{12}$ Mc/s	P18	P18
68 - 88 Mc/s	$fx = \frac{fc}{24}$ Mc/s	P18	P17*
88 -108 Mc/s	$fx = \frac{fc}{24}$ Mc/s	P18	P17*
108-132 Mc/s	$fx = \frac{fc}{24}$ Mc/s	P18	P17*
132-156 Mc/s	$fx = \frac{fc}{36}$ Mc/s	P18	P17*
148-174 Mc/s	$fx = \frac{fc}{36}$ Mc/s	P18	P17*
79 -101 Mc/s	$fx = \frac{fc}{24}$ Mc/s	P18	P17*

* Denotes oven control is required.

CHAPTER III

INSTALLATION AND OPERATION

FUSES

It is essential that the correct rating and type of fuse is used as given in the Parts Lists at the rear of this manual. The use of any other rating or type of fuse may result in damage to the equipment. The fuses are located at the rear of the chassis.

INSTALLATION

1. Check the a.c. and set the transformer taps in the receiver and the transmitter power supply unit accordingly. Equipments are normally despatched from the factory set for 240V operation.

2. Connect the transmitter for either a 25W or 60W power output as follows:-

   (a) 25W operation - connect pin 4 of 2MR3 to tag 9 of 2T1 and short out the 2kΩ resistor 1R53 in the screen circuit of 1V6.

   (b) 60W operation - connect pin 4 of 2MR3 to tag 10 of 2T1 and short out the 7kΩ resistor 1R31 in the screen circuit of 1V6.

3. Connect the rear terminal strips, the antenna connectors and the local microphone or handset as shown in the appropriate Pye Fixed Station Plan diagram. Some of these plan diagrams show the interconnections for plugs and sockets of the Pye extension or remote control panel in addition to those for the transmitter and receiver. Fig.22 shows Plan 1A which may also be used to connect the fixed station for test purposes.

4. Connect the a.c. power input sockets to the receiver and transmitter power supply unit chassis, and connect the a.c. supply to the power input plug PLJ at the rear of the cabinet.

ANTENNA PLUG ASSEMBLY

Connect the antenna plug to the coaxial cable as follows:-

1. Unscrew and remove the clamp nut and hole stopper, then remove the gasket and ferrule from the connector body.

2. Cut the end of the cable squarely, cut off 1 5/8" of the cable sheath and slide the clamp nut (head leading) and gasket on the cable.

3. Cut the braid to $\frac{1}{4}$", comb out the braid wires and fold them back over the sheath.

4. Slide the ferrule over the exposed dielectric and push the ferrule fully home between the braid and dielectric. Trim the braid to the edge of the ferrule.

5. Cut off the dielectric 21/32" from the face of the ferrule and tin the exposed centre conductor. Bend it into an arc and feed it through the stub in the connector body.

6. Insert the gasket and clamp nut into the connector body and tighten the clamp nut.

7. Trim off the excess centre conductor, solder securely and replace the hole stopper.

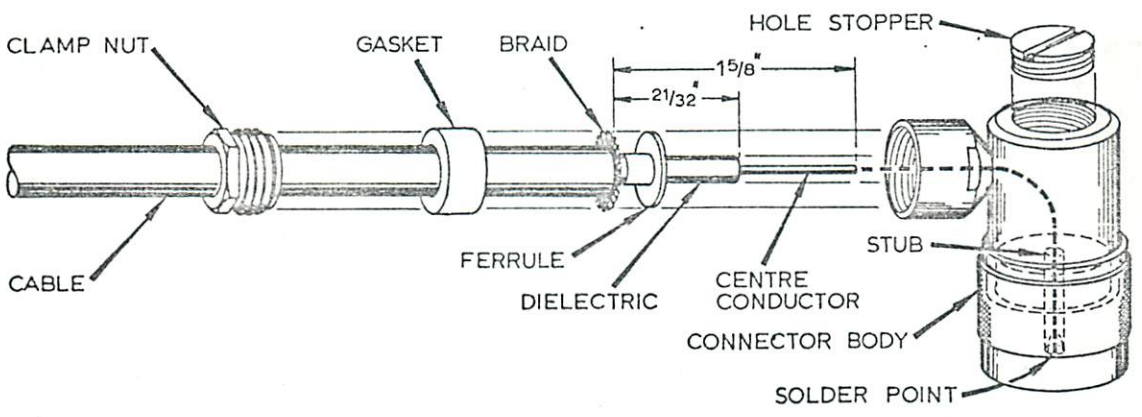


Fig. 3 Antenna Plug Assembly

INITIAL ADJUSTMENTS

The transmitter and receiver frequencies should be regarded as reference frequencies and must not be adjusted except against a frequency substandard (see Appendix).

1. Select position 4 of the METER SWITCH 2SJ and the LP position of the LP-OFF-HP switch 2SK.

2. Switch on the transmitter and receiver and allow at least one minute for warming up.

3. Press the TRANSMIT switch and check that the neon 2ILP2 strikes, indicating that the transmitter h.t. supply circuit is made. Also check that 2ILP2 strikes when the microphone press-to-talk switch is operated.

Transmitter

1. Select the HP position of the LP-OFF-HP switch 2SK.

2. Operate the TRANSMIT switch and adjust the antenna trimming capacitor 1C66 for maximum meter reading.

3. If the meter reading is not between 260μA and 280μA for 25W output, or 450-480μA for 60W output, adjust the coupling between 1L8 and 1L9. After each adjustment of the coupling control, tune 1C64 for greatest dip in the meter reading and readjust 1C66 for maximum reading until readings are within these limits.

Adjustment of Microphone and Line Gain Controls

1. Set the microphone gain control 2RV1 or line gain control 2RV2 to maximum (fully clockwise).

2. Connect an oscilloscope across the maximum deviation control 1RV5.

3. Modulate the transmitter to limiting conditions by whistling loudly into the microphone and note the amplitude of the clipped waveform.

4. Place the microphone approximately 6 inches from the mouth and modulate the transmitter by speaking in a normal voice. Adjust the microphone or line gain control until the amplitude of the waveform approaches that previously observed but without being clipped.

5. If undue modulation is caused by local noise at the operating site, the microphone or line gain control should be backed off. In this case it will be necessary to speak progressively closer to the microphone until the oscilloscope indicates the desired condition.

NOTE: Increasing the microphone or line gain control above the level at which clipping takes place will result in distortion.

Receiver

1. Turn the front panel VOLUME and SQUELCH controls fully clockwise and adjust the a.f. gain control RV1 at the rear of the receiver for adequate loudspeaker volume. Too high a setting of RV1 may cause distortion at all positions of the VOLUME control.

2. Under no-signal conditions, turn back the SQUELCH control RV2 until the squelch relay just releases, silencing the receiver. A less sensitive setting may be used to eliminate unwanted weak signals, provided the receiver will respond to signals from a mobile transmitter at extreme range.

3. When crystal ovens are fitted, check the operation of the oven thermostats by noting that the lamps light when the equipment is first switched on, i.e. before the ovens reach working temperature.

OPERATION

On completion of the installation and initial adjustments, the equipment should be given an operational test under the supervision of the engineer in charge.

It is useful to check the signal strengths of mobiles operating at various locations in the service area so that the correct SQUELCH control setting can be determined.

CHAPTER IV

SERVICING

SECTION 1

The performance figures given in the Alignment Charts (Fig. 23 & Fig. 24) are for new equipments and equipments regularly maintained.

DISMANTLING PROCEDURE

To remove the transmitter or receiver unit, release the four screws in the front panel and withdraw the unit from the front of the cabinet. The electrical connections are of sufficient length to allow both the transmitter and the receiver units to be withdrawn and stood in front of the cabinet for servicing.

To gain access to the p.a. valve, tank circuit components and antenna changeover relay, remove the screening box after releasing the two screws which are accessible from above the transmitter chassis.

The receiver is enclosed by two metal screening covers which are secured to the top and bottom of the chassis by Dzus fasteners. To remove the top cover, release the four Dzus fasteners and lift it from the rear of the receiver to clear the front panel lip. The bottom cover can be removed by releasing the two Dzus fasteners and sliding it out of the runners from the rear of the receiver.

Removal of Printed Circuit Boards in Receiver

The printed circuit boards, with the exception of the 2nd I.F. Unit and Audio Unit, are mounted on pillars to which they are secured in the following manner:-

R.F. Unit	six 6 B.A. screws
1st I.F. Unit	four 4 B.A. hexagon pillars (tapped 6 B.A.) and one 4 B.A. hexagon pillar with slotted end.
2nd Mixer Unit	five 4 B.A. hexagon pillars (tapped 6 B.A.) These pillars support the shield which is retained by five 6 B.A. screws.
Squelch Unit	five 6 B.A. screws
Squelch Relay Driver Unit	four 6 B.A. screws
Audio Driver Unit	four 6 B.A. screws

The 2nd I.F. Unit and the Audio Unit are each mounted at one end on a bracket which is secured to the chassis by two 6 B.A. screws; the other end is secured by one 2 B.A. screw.

All electrical connections to the boards are made to pins which are accessible from the top.

POWER TRANSISTOR CIRCUITS

If transistor damage is suspected, continuity checks should be carried out as shown in Fig. 4. The ohmmeter should have an internal or external resistance of approximately 1kΩ in circuit. If these results are not obtained a replacement transistor should be fitted but the power should not be applied to the equipment until the cause of the transistor failure has been ascertained and remedied.

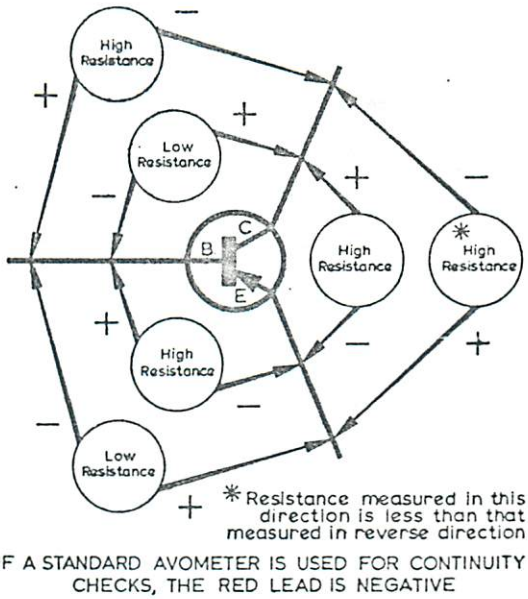

High Resistance
Low Resistance
B
C
E
High Resistance
* High Resistance
High Resistance
Low Resistance
* Resistance measured in this direction is less than that measured in reverse direction
IF A STANDARD AVOMETER IS USED FOR CONTINUITY CHECKS, THE RED LEAD IS NEGATIVE

Fig. 4 Power Transistor Continuity Checks

If the audio output transistor VT702 is replaced, the correct bias should be set by RV701 as detailed in the Receiver Alignment Chart Fig. 23.

ROUTINE MAINTENANCE PROCEDURE

Test Equipment Required

1. Pye Test meter Type TM1 *
2. Audio output meter of 30Ω and 600Ω impedance having a scale reading of up to 2 watts. (Marconi Instruments Ltd. Type TF893 is suitable).

3. Signal generator (see V.H.F. Signal Generators).

4. Multi-range d.c. voltmeter of 20,000Ω/volt sensitivity.

5. R.F. power output meter (The Bird Termaline Model 612 is suitable).

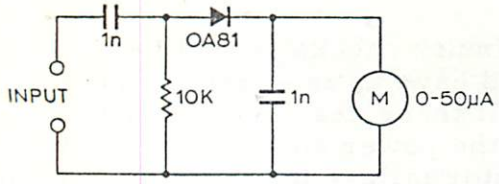


Fig. 5 Diode Probe Unit

* If the Pye Test meter Type TM1 is not available, the following equipment will be required:-

H.F. valve voltmeter or diode probe (a suitable circuit is shown in Fig. 5) used in conjunction with a 0-50μA meter.

V.H.F. Signal Generators

Measurements of sensitivity, signal-to-noise ratio, etc., require test equipment of suitable accuracy. The following generators are recommended:-

1. Boonton Radio Corporation, Boonton, New Jersey — Type 202C

2. Marconi Instruments Ltd. — Type TF995A/1-5

General Checks

1. With the a.c. supply disconnected, inspect the equipment for any obvious defects and remove dust.

2. Check the antenna installation and examine the connections of all coaxial plugs and sockets.

3. Connect the a.c. supply and check the operation of the receiver OFF-ON switch, the transmitter LP-OFF-HP switch and the green "supply on" lamps.

4. Operate the TRANSMIT switch and check that the neon indicator strikes.

5. Check that all valves and crystals are firmly seated and that no noise is caused by dirty or loose pin connections.

6. Check the a.f. gain control for noisy and intermittent operation.

7. Check the operation of all relays, and clean contacts if necessary.

8. On switched-channel equipment, check the operation of the CHANNEL selector switches.

9. Where fitted, check that the crystal oven thermostat is operating by noting that the indicator lamp cycles on and off at frequent intervals.

10. Check the receiver voltage (13.5V).

11. Check the transmitter h.t. voltage (exciter and audio stages 300 volts; p.a. stages 300 volts for 25 watts or 600 volts for 60 watts).

Receiver Performance Checks

Typical d.c. voltages, location of components and test points are shown on the Figs. 12, 13 & 14. The complete alignment procedure is given in the Receiver Alignment Chart Fig. 23.

1. Check the second local oscillator

   Using the diode probe, check that the oscillator injection voltage at the junction of MR201 and L201 on the Second Mixer Unit is at least 0.5 volt.

2. Check the first local oscillator

   Transfer the diode probe to the junction of MR1 and L5 on the R.F. Unit and check that the oscillator injection voltage is approximately 0.25 volts. A lower reading is acceptable provided that the sensitivity figures and signal-to-noise ratio agree with those given in para. 3 and 4.

3. Check the sensitivity

   25 to 156 Mc/s

   Connect the d.c. voltmeter, set to the 2.5V range, across the discriminator test points on the Second I.F. Unit. Connect the signal generator to the antenna connector and inject a signal greater than 2mV e.m.f. Adjust the signal generator frequency to obtain zero balance reading on the voltmeter.

   148 to 174 Mc/s

   Connect the audio output meter set to 30Ω impedance in parallel with the loudspeaker. Connect the signal generator to the antenna socket, inject a signal greater than 2mV e.m.f. and adjust C43 for maximum reading on the output meter.

   Connect the d.c. voltmeter (set to 2.5V range) across the discriminator test-points on the Second I.F. Unit. Adjust the signal generator frequency to obtain zero balance reading on the voltmeter.

Connect the audio output meter, set to 30Ω impedance, in parallel with the loudspeaker. Switch off the signal generator, turn the SQUELCH control fully clockwise and adjust the a.f. gain control to obtain a noise output at least 20 dB greater than the minimum reading of the audio output meter.

Switch on the signal generator and reduce its output until the noise output is 20 dB below that obtained with the signal generator switched off. Check that a change in noise level of 20 dB is obtained when the signal generator is switched on and off.

Connect the signal generator via a 0.1μF capacitor to the test points listed, tuned to the appropriate frequency, and check that the signal generator output required to obtain 20 dB quieting approximate to the typical figures shown below:-

Test Point	Frequency	Nominal Sensitivity
Second I.F. Unit input	455 kc/s	60μV e.m.f.
Second Mixer Unit input	6 Mc/s (25- 68 Mc/s) 10.7 Mc/s (68-174 Mc/s)	200μV e.m.f.
First I.F. Unit input	6 Mc/s (25- 68 Mc/s) 10.7 Mc/s (68-174 Mc/s)	12μV e.m.f.
R.F. Unit input	Carrier	1.2μV e.m.f.
Band Pass Filter output	455 kc/s	60μV e.m.f.
Band Pass Filter input	455 kc/s	96μV e.m.f.

4. Check the signal-to-noise ratio

With the signal generator and audio output meter connected as in para 3, inject an r.f. signal of 2μV e.m.f. modulated at 1000 c/s (±2.5 kc/s deviation for 25 kc/s channel spacing or ±3.5 kc/s deviation for 50 kc/s channel spacing).

Set the VOLUME control fully clockwise, adjust the a.f. gain control for an audio output of 100mW (10mW on meter) and note the reading on the dB scale. Switch off the modulation and note the fall in dB of the audio output to give the signal-to-noise ratio, which should be a minimum of 22 dB for 25 kc/s channel spacing or a minimum of 25 dB for 50 kc/s channel spacing.

5. Check the squelch sensitivity

Set the SQUELCH control to the threshold of operation with no incoming signal. With the signal generator connected to the antenna connector, check that the squelch relay operates on an unmodulated r.f. signal at 3 dB below the 20 dB quieting level.

6. Check the audio output

With the signal generator and audio output meter connected as in para.3,

inject an r.f. signal of 2mV e.m.f. modulated at 1000 c/s (±2.5 kc/s deviation for 25 kc/s channel spacing or ±3.5 kc/s for 50 kc/s channel spacing). Adjust the a.f. gain control for an audio output of 500mW (50mW on meter). Transfer the output meter, set to 600Ω, to terminals J and K of TS3 and check that the output is not less than 20mW.

Transmitter Performance Checks

Typical d.c. voltages are shown on the circuit diagrams (Fig.16 & Fig.18). The complete alignment procedure is given in the Transmitter Alignment Chart (Fig.24).

1. Check the r.f. stages

Measure the grid current of the multiplier and driver stages and the grid and anode current of the P.A. stage.

METER SWITCH position			Reading μA
1.	Not used		-
	Grid current 1V2 & 1V3	(25- 68 Mc/s)	250
		(68-174 Mc/s)	250
2.	Grid current 1V2, 1V5a & 1V5b	(25- 68 Mc/s)	250
	Grid current 1V4, 1V5a & 1V5b	(68-174 Mc/s)	300
3.	Grid current 1V6		260-280
4.	Anode current 1V6	(25 watts)	450-480
		(60 watts)	
5.	Not used		

2. Check the r.f. power output (25 watts or 60 watts). Remove the power output meter and re-connect the antenna.

3. Adjust the antenna trimming capacitor 1C66 for maximum meter reading (position 4) and adjust the line or microphone gain control as described on page 16. Remove all test equipment and replace both the receiver unit and the transmitter unit into the cabinet, ensuring that all fastenings are tight and that all the external connections are properly made. Call up the mobile stations for a final operational check.

D.C. RESISTANCE OF INDUCTORS

RECEIVER

	Winding	Tag No.	Resistance
T201 Second i.f. transformer	Primary		3.7Ω
	Secondary		9.6Ω
T301 Second i.f. transformer	Primary		11.5Ω
	Secondary		2Ω
T302 Second i.f. transformer	Primary		11.5Ω
	Secondary		2Ω
T303 Discriminator transformer	Primary		8Ω
	Secondary		0.25Ω
L501 Filter choke			4Ω
L502 Filter choke			18Ω
T701 Audio driver transformer	Primary	1-2	167Ω
	Secondary	3-4	3.8Ω
T702 Audio output transformer	Primary	1-2	2.85Ω
	Secondary	3-4	0.345Ω
T703 Line transformer	Primary	(red spot)	7.15Ω
	Secondary		153Ω
T801 Power input transformer	Primary	1-4	54.2Ω
		4-7	127Ω
	Secondary	9-10	68Ω
		11-12	3.6Ω
		13-14	2.35Ω
T802 Oven heater transformer	Primary	1-2	169Ω
		2-3	321Ω
		4-5	2.15Ω
L807 Smoothing choke			1.35Ω

TRANSMITTER

1L1 Oscillator cathode choke			7.6Ω
1L10 1H choke			250Ω

TRANSMITTER POWER SUPPLY

2T1 Power input transformer	Primary	1-4	0.8Ω
		4-7	1.77Ω
	Secondary	8-10	34Ω
		12-13	42Ω
		14-15	18.5Ω
		16-17	0.012Ω
2L1 Smoothing choke			97Ω
2L2 Smoothing choke			97Ω

SECTION II

CHANGE OF CHANNEL SPACING

TRANSMITTER

The crystal should be replaced with one of the appropriate Specification No. as given in TRANSMITTER CRYSTAL INFORMATION. When ordering crystals the exact operating frequency and Specification No. required must be stated.

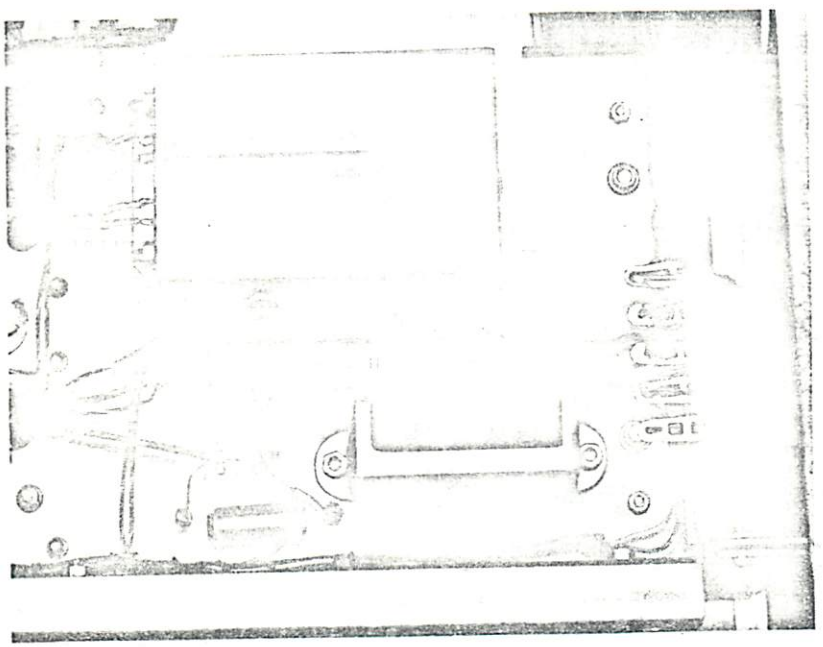


Fig.6 Band Pass Block Filter Location

RECEIVER

To change the receiver channel spacing, replace the band pass filter and change the values of R332, R339 on the 2nd I.F. Unit; (a complete printed circuit board assembly is available for 25 kc/s or 50 kc/s channel spacing if required). The Part No. of these items will be found in the Parts Lists at the rear of this manual.

The filter is secured by one 6 B.A. screw located above the chassis underneath the 2nd I.F. Unit, and by two 4 B.A. nuts secured to a bracket below the chassis.

Unsolder the connections to the 2nd I.F. Unit and remove the board, after releasing the two 6 B.A. and one 2 B.A. screws. Replace R332 and R339 with resistors of the correct values.

Unsolder the leads to the filter, release the 6 B.A. screw above the chassis and the two 4 B.A. securing nuts on the bracket below the chassis, and remove the filter.

Secure the new filter and remake the connections. Replace the 2nd I.F. Unit, secure the retaining screws and remake the connections.

Check the performance and if necessary, re-align the discriminator as detailed in Fig.23.

CHANGE FROM SINGLE TO SWITCHED CHANNEL OPERATION

The following items, available as a complete replacement kit, are required when the equipment is changed from single channel to switched channel operation within the same frequency band.

TRANSMITTER	RECEIVER
Replacement escutcheon	Replacement escutcheon Switch plate
Channel switch (SC) and bush, stub shaft assembly and knob	Channel switch (SA) and knob
Crystal holders (3 crystals per holder)*	Crystal holders (3 crystals per holder)*
Crystal trimming capacitors (one per channel)	680Ω resistors and crystal trimming coils (one of each per channel)
2pF capacitor (C81)	2nF capacitor (C801) Replacement C805.

* 1 crystal per holder when crystal ovens are used (see FITTING CRYSTAL OVENS)

When ordering complete replacement kit the order should state:-

(a) Number of channels required.

(b) Exact operating frequencies

(c) Crystal Specification No. for the required band and channel spacing (Refer to CRYSTAL INFORMATION).

Part No. of individual items will be found in the Parts Lists at the rear of this manual.

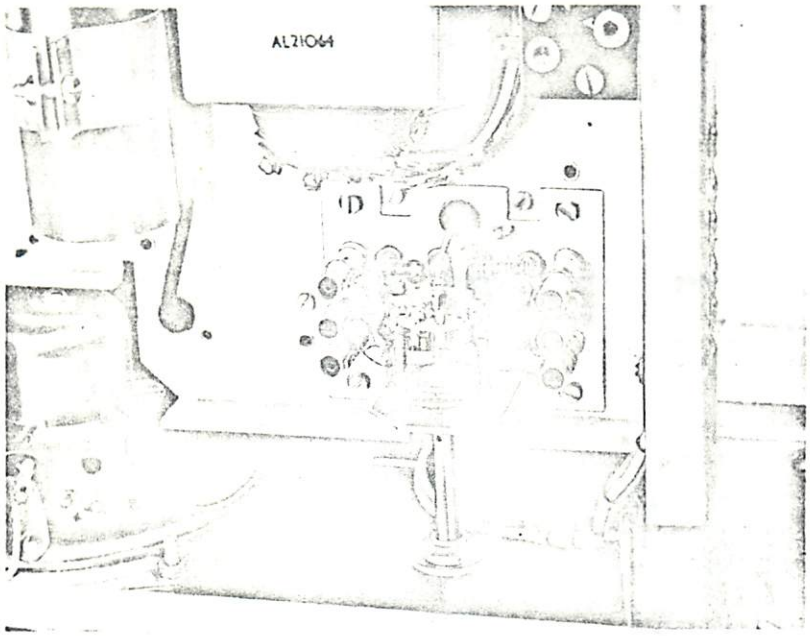


Fig.7 Receiver Switched Channel Assembly

RECEIVER

1. Remove the VOLUME control knob. Take off the securing nuts from the VOLUME and SQUELCH controls and the OFF/ON switch. Remove the escutcheon and transfer the green lens and PYE medallion to the replacement escutcheon.

2. Fit the replacement escutcheon. This is provided with an additional hole which corresponds with the normally blanked-off hole in the front panel. Fit and secure the VOLUME and SQUELCH controls in their original positions, but replace the OFF/ON switch in the hole below the green lens.

3. Fit a crystal trimmer in the shaped hole on the plate assembly adjacent to each crystal position. Complete the connections from the trimming coils to the switch and crystal holders as shown on the Receiver Circuit Diagram.

4. Disconnect the leads to pins 6 and 7 of the R.F. Unit board at the switch plate terminations. Remove the existing plate assembly. Mount the new assembly and remake the connections to the R.F. Unit board, ensuring that pin 7 is connected to the moving arm contact of the channel switch. Connect the replacement capacitor C805 across pins 6 and 7. Fit the channel switch knob and insert the new crystals.

5. Set the crystal trimming coils L801-L806 to the required frequencies (see Appendix) and align the receiver as detailed in the Receiver Alignment Chart Fig.23.

TRANSMITTER

1. Remove the METER SWITCH knob and neon lamp lens; disconnect and remove the meter. Release the retaining nuts from the LP-OFF-HP, METER and TRANSMIT switches.

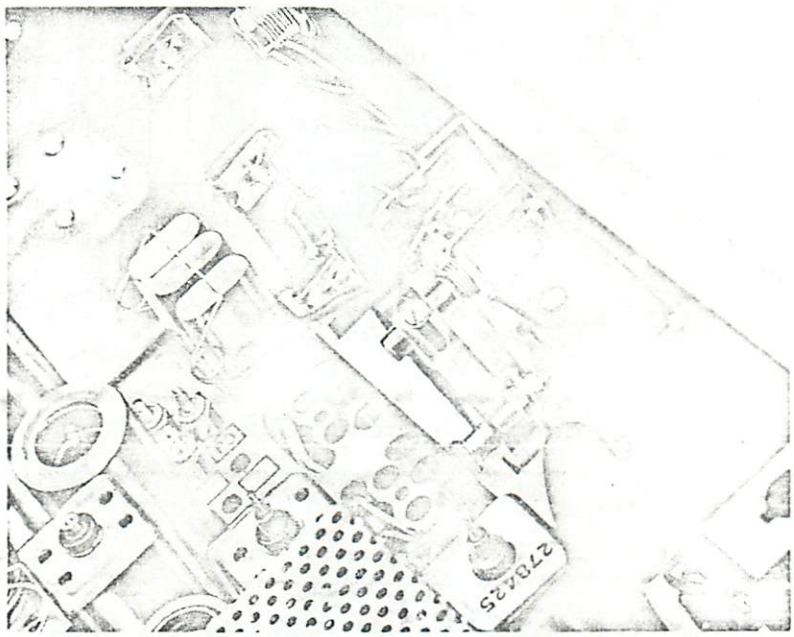


Fig.8 Transmitter Switched Channel Assembly

2. Remove the escutcheon and transfer the green lens and PYE medallion to the replacement escutcheon.

3. Fit the replacement escutcheon. Replace the meter, the LP-OFF-HP, METER, TRANSMIT switches, the neon lens and knobs.

4. Disconnect and remove the existing crystal holder, 1R1 and capacitor 1C7.

5. Fit the channel switch to the transmitter chassis and the stub shaft assembly to the additional hole in the front panel. Fit the knob and connect the drive band between the stub shaft and switch bush, ensuring that the switch can be rotated by the stub shaft, and the channel positions of the switch and knob align.

6. Fit the crystal holders, 1R1 and additional crystal trimmers to the chassis as shown in Fig. 8 and connect these components to the switch 1SC as shown in the Transmitter Circuit Diagram Fig. 16 & 18.

7. Connect 1C81 and the moving arm contact of 1SC as shown in the Transmitter Circuit Diagram and fit the new crystals.

8. Set the crystal trimming capacitors 1C1-1C6 for the required frequencies (see Appendix) and align the transmitter as detailed in the Transmitter Alignment Chart of Fig. 24.

FITTING CRYSTAL OVENS

The Part No. of the following items, required for fitting oven control, will be found in the Parts Lists at the rear of this manual.

Transmitter	Receiver
Crystal oven base assemblies	Crystal holders
Crystal ovens	Crystal ovens
	Crystal oven clips
Crystal oven clips	Lampholders and lamps
Lampholders and lamps	Heater transformer (when 2 ovens fitted)

RECEIVER

Remove the existing crystal holders and 680Ω resistors. Fit the crystal oven holders and replace the 680Ω resistors. Fit the lampholders in the lamp bracket and connect the crystal holders, ovens and lampholders as shown in the Receiver Circuit Diagram.

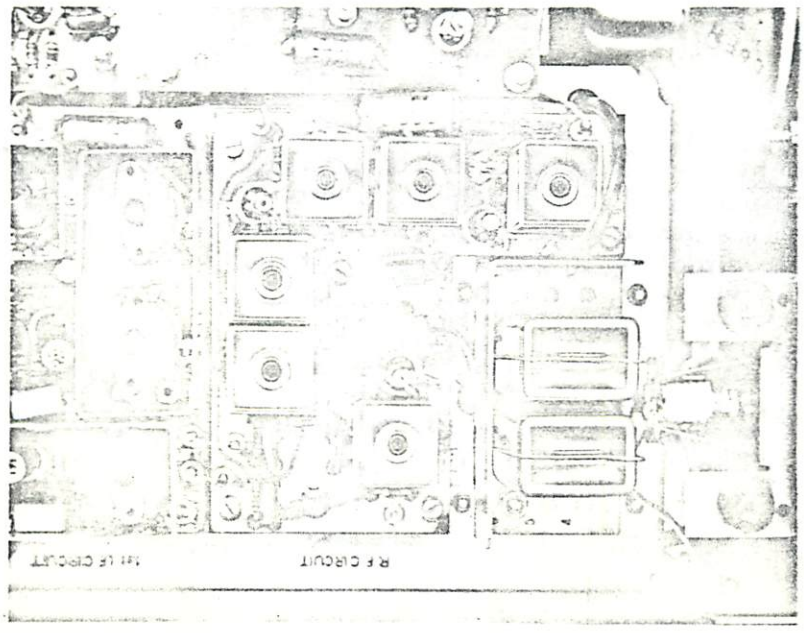


Fig. 9 Receiver Oven and Indicator Lamp Assembly

When two ovens are fitted the heater transformer should be mounted under the chassis using the holes adjacent to the VOLUME control and C516. The Audio Unit board must be displaced to allow access for securing the transformer. Connections between the transformer, supply and the oven are shown in the Receiver Circuit Diagram; T802 pins 1 and 2 are connected to TS2 for 100-150V operation, and T802 pins 1 and 3 are connected to TS2 for 190-240V operation. Fit the crystals and lamps prior to checking and aligning the R.F. Unit as necessary.

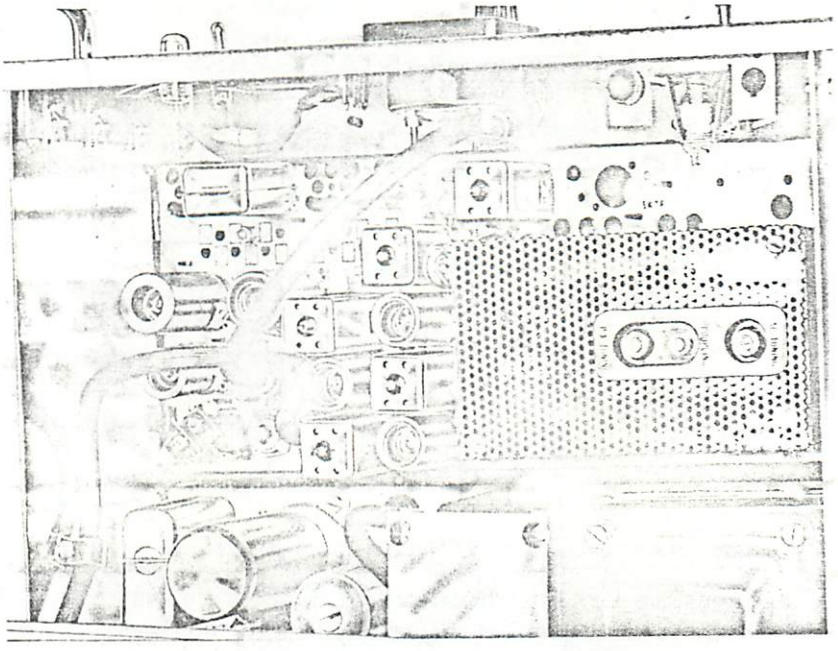


Fig.10 Transmitter Oven and Indicator Lamp Assembly

TRANSMITTER

Remove the existing crystal holders, resistor 1R1 and capacitor 1C7. Fit the replacement crystal oven holders and replace resistor 1R1 and capacitor 1C7. Fit the lampholders in the bracket and connect the crystal holders, ovens and lampholders as shown in the Transmitter Circuit Diagram. Fit the crystals and lamps prior to checking and aligning the transmitter as necessary.

APPENDIX

OSCILLATOR ALIGNMENT

Alignment of the transmitter oscillator and receiver first local oscillator does not form part of the normal alignment procedure. If it is found necessary to check or re-set the oscillator frequency, a frequency meter having an accuracy of better than 1 p.p.m. will be required.

Detailed information on the operation of the frequency meter is supplied by the manufacturer but the following points should be noted:-

(a) Measurements can be made of either the carrier frequency (transmitter only) or the crystal frequency.

(b) If the carrier frequency is measured, the coupling between the transmitter and the frequency meter should be the minimum required to obtain a reading. In general there should be no direct coupling and it may be necessary to separate the transmitter and meter by a few feet.

(c) If the transmitter crystal frequency is measured, the tag point 1TP on the transmitter chassis should be connected to the meter by coaxial cable.

(d) To measure the receiver first local oscillator injection frequency the meter should be connected to the anode of MR1 via a 2nF capacitor. In this case the crystal frequency should be calculated from the receiver first local oscillator crystal formula given in the RECEIVER CRYSTAL INFORMATION.

(e) If crystal ovens are fitted the effect of the oven heat cycling should be observed and the crystal trimmers adjusted as near as possible to the centre of the total excursion of the oven cycle.

PARTS LISTS

ORDERING OF SPARE PARTS

To avoid delays and possible errors in the supply of spare parts the reference numbers shown in these parts lists should be quoted in all orders.

R. F. UNIT

Code		CAPACITORS			Part No.
†C1	33pF	Silver mica	(25-32.5 Mc/s)	350V ±1pF	660847
	39pF	Silver mica	(32.5-42 Mc/s)	350V ±1pF	660864
	22pF	Silver mica	(42 - 54 Mc/s)	350V ±1pF	660845
	15pF	Ceramic	(54 - 68 Mc/s)	± 5%	PN10037
	10pF	Ceramic	(68 - 88 Mc/s)	± 5%	PN09031
	10pF	Ceramic	(88 -108 Mc/s)	± 5%	PN09031
	8.2pF		(108-132 Mc/s)	± 5%	PN07038
	12pF	Ceramic	(132-156 Mc/s)	± 5%	PN09111
	10pF	Ceramic	(148-174 Mc/s)	± 5%	PN09031
	12pF	Ceramic	(79 -101 Mc/s)	± 5%	PN09111
†C2	150pF	Silver mica	(25-32.5 Mc/s)	350V ± 2%	PP09405
	390pF	Silver mica	(32.5-42 Mc/s)	350V ± 2%	664587
	220pF	Silver mica	(42 - 54 Mc/s)	200V ± 2%	660865
	150pF	Silver mica	(54 - 68 Mc/s)	350V ± 2%	PP09405
	68pF	Silver mica	(68 - 88 Mc/s)	350V ± 2%	660849
	100pF	Silver mica	(88 -108 Mc/s)	350V ± 2%	660857
	56pF	Silver mica	(108-132 Mc/s)	350V ± 2%	PP07205
	82pF	Silver mica	(132-156 Mc/s)	350V ± 2%	660861
	68pF	Silver mica	(148-174 Mc/s)	350V ± 2%	660849
	120pF	Silver mica	(79 -101 Mc/s)	± 2%	PP08854
C3	2nF	Disc ceramic		+40% -20%	660461
C4	2nF	Disc ceramic		+40% -20%	660461
†C5	27pF	Silver mica	(25-32.5 Mc/s)	350V ±1pF	660846
	39pF	Silver mica	(32.5-42 Mc/s)	350V ±1pF	660864
	22pF	Silver mica	(42 - 54 Mc/s)	350V ±1pF	660845
	15pF	Ceramic	(54 - 68 Mc/s)	± 5%	PN10037
	10pF	Ceramic	(68 -108 Mc/s)	± 5%	PN09031
	8.2pF	Ceramic	(108-132 Mc/s)	± 5%	PN07038
	12pF	Ceramic	(132-156 Mc/s)	± 5%	PN09111
	10pF	Ceramic	(148-174 Mc/s)	± 5%	PN09031
	12pF	Ceramic	(79 -101 Mc/s)	± 5%	PN09111
†C6	2nF	Disc ceramic		+40% -20%	660461
C7	1.8pF	Ceramic	(25-32.5 Mc/s)	±0.1pF	PN00176
	1.2pF	Ceramic	(32.5-42 Mc/s)	±0.1pF	PN00060
	0.7pF	Ceramic	(42 - 54 Mc/s)	±0.1pF	266547
	0.3pF	Ceramic	(54 - 68 Mc/s)	±0.1pF	266297
	0.2pF	(10MΩ resistor used as capacitance)	(68 - 88 Mc/s)		PM00273
	0.3pF	Ceramic	(88 -108 Mc/s)	±0.1pF	266297
	0.4pF	Ceramic	(108-156 Mc/s)	±0.1pF	PN00010
	0.2pF	(10MΩ resistor used as capacitance)	(148-174 Mc/s)		PM00273
	0.3pF	Ceramic	(79 -101 Mc/s)	±0.1pF	266297
C8	0.1μF	Foil			653632
†C9	27pF	Silver mica	(25-32.5 Mc/s)	350V ±1pF	660846
	47pF	Silver mica	(32.5-42 Mc/s)	350V ±1pF	660848
	27pF	Silver mica	(42 - 54 Mc/s)	350V ±1pF	660846
	15pF	Ceramic	(54 - 68 Mc/s)	± 5%	PN10037
	10pF	Ceramic	(68 -108 Mc/s)	± 5%	PN09031
	8.2pF	Ceramic	(108-132 Mc/s)	± 5%	PN07038
	12pF	Ceramic	(132-156 Mc/s)	± 5%	FN09111
	10pF	Ceramic	(148-174 Mc/s)	± 5%	PN09031
	18pF	Ceramic	(79 -101 Mc/s)	± 5%	PN10118
†C10	2nF	Disc ceramic		+40% -20%	660461
C11	2nF	Disc ceramic	(25 - 68 Mc/s)	+40% -20%	660461
		Not used	(68 - 88 Mc/s)		
	2nF	Disc ceramic	(88 -156 Mc/s)	+40% -20%	660461
		Not used	(148-174 Mc/s)		
		Not used	(79 -101 Mc/s)		
C12	56pF	Silver mica	(25 - 42 Mc/s)	350V ± 2%	660870
	39pF	Silver mica	(42 - 54 Mc/s)	350V ±1pF	PP06405
	56pF	Silver mica	(54 - 68 Mc/s)	350V ± 2%	660870
	47pF	Ceramic	(68 - 88 Mc/s)	± 5%	PN13103
	56pF	Silver mica	(88 -132 Mc/s)	350V ± 2%	660870
	33pF	Silver mica	(132-156 Mc/s)	350V ±1pF	660847
	47pF	Ceramic	(148-174 Mc/s)	± 5%	PN13103
	47pF	Ceramic	(79 -101 Mc/s)	± 2%	PN13122
C13	4.7pF	Silver mica	(25 - 68 Mc/s)	350V ±0.5pF	660868
	27pF	Ceramic	(68 - 88 Mc/s)	± 5%	PM11124
	4.7pF	Silver mica	(88 108 Mc/s)	350V ±0.5pF	660868
	12pF	Ceramic	(108-132 Mc/s)	± 5%	PN09111
	4.7pF	Silver mica	(132-156 Mc/s)	350V ±0.5pF	660868
	27pF	Ceramic	(148-174 Mc/s)	± 5%	PN11124
	15pF	Ceramic	(79 -101 Mc/s)	± 5%	PN10019
C14	2nF	Disc ceramic		+40% -20%	660461
C15	0.1μF	Foil			653632

Code		CAPACITORS (Cont.)			Part No.
†C16		Not used	(25 - 54 Mc/s)		
	18pF	Ceramic	(54 - 68 Mc/s)	± 5%	PN10118
	10pF	Ceramic	(68 - 88 Mc/s)	± 5%	PN09031
	12pF	Ceramic	(88 -108 Mc/s)	± 5%	PN09111
	10pF	Ceramic	(108-132 Mc/s)	± 5%	PN09031
	12pF	Ceramic	(132-156 Mc/s)	± 5%	PN09111
	10pF	Ceramic	(148-174 Mc/s)	± 5%	PN09031
	12pF	Ceramic	(79 -101 Mc/s)	± 5%	PN09111
†C17	27pF	Silver mica	(25-32.5 Mc/s)	350V ±1pF	660846
	39pF	Silver mica	(32.5-42 Mc/s)	350V ±1pF	660864
	22pF	Silver mica	(42 - 54 Mc/s)	350V ±1pF	660845
	15pF	Ceramic	(54 - 68 Mc/s)	± 5%	PN10037
	10pF	Ceramic	(68 -132 Mc/s)	± 5%	PN09031
	15pF	Ceramic	(132-156 Mc/s)	± 5%	PN10037
	10pF	Ceramic	(148-174 Mc/s)	± 5%	PN09031
	10pF	Ceramic	(79 -101 Mc/s)	± 5%	PN09031
†C18	2nF	Disc ceramic		+40% -20%	660461
†C19		Not used	(25 - 54 Mc/s)		
	2nF	Disc ceramic	(54 - 68 Mc/s)	+40% -20%	660461
		Not used	(68 - 88 Mc/s)		
	2nF	Disc ceramic	(88 -156 Mc/s)	+40% -20%	660461
		Not used	(148-174 Mc/s)		
		Not used	(79 -101 Mc/s)		
C20	1.8pF	Ceramic	(25-32.5 Mc/s)	±0.1pF	PN00176
	1.2pF	Ceramic	(32.5-42 Mc/s)	±0.1pF	PN00060
	0.7pF	Ceramic	(42 - 54 Mc/s)	±0.1pF	266547
	0.3pF	Ceramic	(54 - 68 Mc/s)	±0.1pF	266297
	0.2pF	(10MΩ resistor used as capacitance)	(68 - 88 Mc/s)		PM00273
	0.3pF	Ceramic	(88 -108 Mc/s)	±0.1pF	266297
	0.4pF	Ceramic	(108-156 Mc/s)	±0.1pF	PN00010
	0.2pF	(10MΩ resistor used as capacitance)	(148-174 Mc/s)		PM00273
	0.2pF	(10MΩ resistor used as capacitance)	(79 -101 Mc/s)		PM00273
†C21	27pF	Silver mica	(25-32.5 Mc/s)	350V ±1pF	660846
	47pF	Silver mica	(32.5-42 Mc/s)	350V ±1pF	660848
	27pF	Silver mica	(42 - 54 Mc/s)	350V ±1pF	660846
	15pF	Ceramic	(54 - 68 Mc/s)	± 5%	PN10037
	10pF	Ceramic	(68 - 88 Mc/s)	± 5%	PN09031
	10pF	Ceramic	(88 -132 Mc/s)	± 5%	PN09031
	15pF	Ceramic	(132-156 Mc/s)	± 5%	PN10037
	12pF	Ceramic	(148-174 Mc/s)	± 5%	PN09111
	12pF	Ceramic	(79 -101 Mc/s)	± 5%	PN09111
C22	0.1μF	Foil	(25 - 68 Mc/s)		653632
		Not used	(68 - 88 Mc/s)		
	0.1μF	Foil	(88 -156 Mc/s)		653632
		Not used	(148-174 Mc/s)		
		Not used	(79 -101 Mc/s)		
C23	0.1μF	Foil			653632
C24	39pF	Silver mica	(25 - 54 Mc/s)	350V ±1pF	660864
	15pF	Silver mica	(54 - 68 Mc/s)	350V ±1pF	660844
		Not used	(68 - 88 Mc/s)		
	15pF	Silver mica	(88 -156 Mc/s)	350V ±1pF	660844
		Not used	(148-174 Mc/s)		
		Not used	(79 -101 Mc/s)		
C25	10nF	Disc ceramic			660006
C26	2nF	Disc ceramic		+40% -20%	660461
C27	12.5μF	Electrolytic		25V	PS24144
C28	2nF	Disc ceramic	(25 - 68 Mc/s)	+40% -20%	660461
	10nF	Disc ceramic	(68 - 88 Mc/s)		PN50301
	2nF	Disc ceramic	(88 -156 Mc/s)	+40% -20%	660461
	10nF	Disc ceramic	(148-174 Mc/s)		PN50301
	10nF	Disc ceramic	(79 -101 Mc/s)		PN50301
C29		Not used	(25 -108 Mc/s)		
	18pF	Ceramic	(108-132 Mc/s)	± 5%	PN10118
		Not used	(132-174 Mc/s)		
		Not used	(79 -101 Mc/s)		
C30 to C32		Not used			
C33	2nF	Disc ceramic	(25 - 68 Mc/s)	+40% -20%	660461
		Not used	(68 - 88 Mc/s)		
	2nF	Disc ceramic	(88 -156 Mc/s)	+40% -20%	660461
		Not used	(148-174 Mc/s)		
		Not used	(79 -101 Mc/s)		

R. F. UNIT (Cont.)

CAPACITORS (Cont.)

Code					Part No.
C34		Not used	(25 - 68 Mc/s)		
	33pF	Ceramic	(68 - 88 Mc/s)	± 5%	PN12092
		Not used	(88 -156 Mc/s)		
	33pF	Ceramic	(148-174 Mc/s)	± 5%	PN12092
	82pF	Silver mica	(79 -101 Mc/s)	350V ± 2%	PP08203
C35		Not used	(25 - 68 Mc/s)		
	2nF	Disc ceramic	(68 - 88 Mc/s)		PN33301
		Not used	(88 -156 Mc/s)		
	2nF	Disc ceramic	(148-174 Mc/s)		PN33301
	2nF	Disc ceramic	(79 -101 Mc/s)		PN33301
C36		Not used	(25 - 68 Mc/s)		
	2nF	Disc ceramic	(68 - 88 Mc/s)		PN33301
		Not used	(88 -156 Mc/s)		
	2nF	Disc ceramic	(148-174 Mc/s)		PN33301
	2nF	Disc ceramic	(79 -101 Mc/s)		PN33301
C37		Not used	(25 - 68 Mc/s)		
	0.3pF	Ceramic	(68 - 88 Mc/s)	±0.1pF	PN00001
		Not used	(88 -156 Mc/s)		
	0.5pF	Ceramic	(148-174 Mc/s)	±0.1pF	PN00003
	0.7pF	Ceramic	(79 -101 Mc/s)	±0.1pF	PN00013
C38		Not used	(25 - 68 Mc/s)		
	47pF	Ceramic	(68 - 88 Mc/s)	±1pF	PP06671
		Not used	(88 -156 Mc/s)		
	18pF	Ceramic	(148-174 Mc/s)	± 5%	PN10118
	12pF	Ceramic	(79 -101 Mc/s)		
C39		Not used	(25 - 68 Mc/s)		
	10pF	Ceramic	(68 - 88 Mc/s)	± 5%	PN09031
		Not used	(88 -156 Mc/s)		
	15pF	Ceramic	(148-174 Mc/s)	± 5%	PN10037
	22pF	Ceramic	(79 -101 Mc/s)	± 5%	PN11050
C40		Not used	(25 - 68 Mc/s)		
	5.6pF	Ceramic	(68 - 88 Mc/s)	±0.25pF	PN04132
		Not used	(88 -156 Mc/s)		
	5.6pF	Ceramic	(148-174 Mc/s)	±0.25pF	PN04132
	150pF	Silver mica	(79 -101 Mc/s)	350V ± 5%	PP09405
C41		Not used	(25 - 68 Mc/s)		
	10nF	Foil	(68 - 88 Mc/s)		PQ25000
		Not used	(88 -156 Mc/s)		
	10nF	Foil	(148-174 Mc/s)		PQ25000
	10nF	Foil	(79 -101 Mc/s)		PQ25000
C42		Not used	(25 - 68 Mc/s)		
	10nF	Disc ceramic	(68 - 88 Mc/s)		PN50301
		Not used	(88 -156 Mc/s)		
	10nF	Disc ceramic	(148-174 Mc/s)		PN50301
	10nF	Disc ceramic	(79 -101 Mc/s)		PN50301
C43		Not used	(25 -156 Mc/s)		
	2-11pF	Trimmer	(148-174 Mc/s)		PV05005
		Not used	(79 -101 Mc/s)		
C44		Not used	(25 -156 Mc/s)		
	22pF	Ceramic	(148-174 Mc/s)	± 5%	PN11050
		Not used	(79 -101 Mc/s)		

RESISTORS

†R1	470Ω	Composition		0.1W ±10%	267450
R2	270Ω	Composition		0.1W ±10%	267447
R3	560Ω	Composition		0.1W ±10%	267451
†R4	470Ω	Composition		0.1W ±10%	267450
R5	5.6kΩ	Composition	(25 - 68 Mc/s)	0.1W ±10%	267463
	47kΩ	Composition	(68 - 88 Mc/s)	0.1W ±10%	NG47303
	5.6kΩ	Composition	(88 -156 Mc/s)	0.1W ±10%	267463
	47kΩ	Composition	(148-174 Mc/s)	0.1W ±10%	NG47303
	47kΩ	Composition	(79 -101 Mc/s)	0.1W ±10%	NG47303
R6	680Ω	Composition	(25 - 68 Mc/s)	0.1W ±10%	267452
	12kΩ	Composition	(68 - 88 Mc/s)	0.1W ±10%	NG12303
	680Ω	Composition	(88 -156 Mc/s)	0.1W ±10%	267452
	12kΩ	Composition	(148-174 Mc/s)	0.1W ±10%	NG12303
	4.7kΩ	Composition	(79 -101 Mc/s)	0.1W ±10%	NG47203
R7	68Ω	Composition		0.1W ±10%	267440
R8	470Ω	Composition		0.1W ±10%	267450
R9	560Ω	Composition		0.1W ±10%	267451
†R10	470Ω	Composition		0.1W ±10%	267450
R11	270Ω	Composition		0.1W ±10%	267447
R12	470Ω	Composition		0.1W ±10%	267450
R13	470Ω	Composition		0.1W ±10%	267450
R14	1kΩ	Composition		0.1W ±10%	267454
R15		Not used			
R16		Not used			
R17	470Ω	Composition	(25 - 54 Mc/s)	0.1W ±10%	267450
		Not used	(54 -174 Mc/s)		
R18		Not used	(25 - 88 Mc/s)		
		Not used	(88 -174 Mc/s)		
	470Ω	Composition	(79 -101 Mc/s)	0.1W ±10%	NG47103

† Components mounted in cans

SEMICONDUCTORS

Code			Part No.
VT1	Transistor OC171	(25-32.5 Mc/s)	865344
	Transistor AFZ11	(32.5-68 Mc/s)	865381
	Transistor GM378B	(68 - 88 Mc/s)	FV09827
	Transistor AFZ12	(88 -156 Mc/s)	865382
	Transistor GM378B	(148-174 Mc/s)	FV09827
	Transistor GM378B	(79 -101 Mc/s)	FV09827
VT2	Transistor OC171	(25-32.5 Mc/s)	865344
	Transistor AFZ11	(32.5-68 Mc/s)	865381
	Transistor GM378B	(68 - 88 Mc/s)	FV09827
	Transistor AFZ12	(88 -156 Mc/s)	865382
	Transistor GM378B	(148-174 Mc/s)	FV09827
	Transistor GM378B	(79 -101 Mc/s)	FV09827
VT3	Transistor OC171	(25 - 42 Mc/s)	865344
	Transistor AFZ11	(42 - 54 Mc/s)	865381
	Transistor OC171	(54 - 68 Mc/s)	865344
	Transistor GM378B	(68 - 88 Mc/s)	FV09827
	Transistor OC171	(88 -108 Mc/s)	865344
	Transistor AFZ11	(108-156 Mc/s)	865381
	Transistor GM378B	(148-174 Mc/s)	FV09827
	Transistor AFZ11	(79 -101 Mc/s)	FV05067
MR1	Diode GEX66		705654

TRANSFORMERS

†T1	R.F.	(25-32.5 Mc/s)	278686/2
	R.F.	(32.5-88 Mc/s)	278584
	R.F.	(88 -108 Mc/s)	278584/9
	R.F.	(112-136 Mc/s)	278674/2
	R.F.	(132-156 Mc/s)	278665/2
	R.F.	(148-174 Mc/s)	278665/8
	Coil	(79 -101 Mc/s)	278584/38
†T2	Not used	(25 - 54 Mc/s)	
	Multiplier	(54 - 68 Mc/s)	278584/13
	Not used	(68 - 88 Mc/s)	
	Multiplier	(88 -108 Mc/s)	278584/14
	Multiplier	(108-156 Mc/s)	278674/15
	Multiplier	(132-156 Mc/s)	278665/6
	Not used	(148-174 Mc/s)	
	Not used	(79 -101 Mc/s)	
†T3	R.F.	(25-32.5 Mc/s)	278686/4
	R.F.	(32.5-68 Mc/s)	278584/3
	R.F.	(68 - 88 Mc/s)	278584/26
	R.F.	(88 -108 Mc/s)	278584/11
	R.F.	(108-156 Mc/s)	278674/4
	Not used	(148-174 Mc/s)	
	Not used	(79 -101 Mc/s)	

INDUCTORS

†L1	Antenna coil	(25-32.5 Mc/s)	278686
	Antenna coil	(32.5-68 Mc/s)	278584/1
	Antenna coil	(68 - 88 Mc/s)	278584/16
	Antenna coil	(88 -108 Mc/s)	278584/6
	Antenna coil	(108-136 Mc/s)	278674
	Antenna coil	(132-156 Mc/s)	278665
	Antenna coil	(148-174 Mc/s)	278665/7
	Antenna coil	(79 -101 Mc/s)	278584/6
†L2	VT1 collector coil	(25-32.5 Mc/s)	278686/1
	VT1 collector coil	(32.5-54 Mc/s)	278584/12
	VT1 collector coil	(54 - 88 Mc/s)	278584/2
	VT1 collector coil	(88 -108 Mc/s)	278584/7
	VT1 collector coil	(108-136 Mc/s)	278674/1
	VT1 collector coil	(132-174 Mc/s)	278665/1
	VT1 collector coil	(79 -101 Mc/s)	278584/7
L3	Choke		279052
†L4	VT2 collector coil	(25-32.5 Mc/s)	278686/3
	VT2 collector coil	(32.5-68 Mc/s)	278584/5
	VT2 collector coil	(68 - 88 Mc/s)	278584/25
	VT2 collector coil	(88 -108 Mc/s)	278584/8
	VT2 collector coil	(108-136 Mc/s)	278665/3
	VT2 collector coil	(148-174 Mc/s)	278665/9
	VT2 collector coil	(79 -101 Mc/s)	278584/40
L5	Choke		278582
†L6	Not used	(25 - 88 Mc/s)	
	Not used	(88 -156 Mc/s)	
	Choke	(148-174 Mc/s)	278692/1
	Choke	(79 -101 Mc/s)	278692/1
†L7	Not used	(25 - 68 Mc/s)	
	Coil	(68 - 88 Mc/s)	278584/27
	Not used	(88 -156 Mc/s)	
	Coil	(148-174 Mc/s)	278665/10
	Coil	(79 -101 Mc/s)	278584/41

R. F. UNIT (Cont.)

Code	INDUCTORS (Cont.)		Part No.
L8	Not used		
†L9	Not used	(25 - 68 Mc/s)	
	Coil	(68 - 88 Mc/s)	278584/18
	Not used	(88 -156 Mc/s)	
	Coil	(148-174 Mc/s)	278665/11
	Coil	(79 -101 Mc/s)	278584/37
†L10	Not used	(25 - 68 Mc/s)	
	Not used	(88 -156 Mc/s)	
	Coil	(148-174 Mc/s)	278665/10
	Coil	(79 -101 Mc/s)	278584/39
L11	Not used	(25 -156 Mc/s)	
	Coil	(148-174 Mc/s)	AT31250/8
L12	Not used	(25 -108 Mc/s)	
	Choke	(108-132 Mc/s)	AT31636
	Not used	(132-174 Mc/s)	
	Not used	(79 -101 Mc/s)	

† Components mounted in cans

COMPLETE PRINTED CIRCUIT BOARD ASSEMBLIES PART NOS.

(25-32.5 Mc/s)	276250/9	(88 -108 Mc/s)	276250/2
(32.5-42 Mc/s)	276250/4	(108-132 Mc/s)	276250/6
(42 - 54 Mc/s)	276250/3	(132-156 Mc/s)	276250/7
(54 - 68 Mc/s)	276250/8	(148-174 Mc/s)	276490/1
(68 - 88 Mc/s)	276490/5	(79 -101 Mc/s)	276490/10

FIRST I. F. UNIT

Code	CAPACITORS				Part No.
C101	0.1µF	Foil			653632
C102	0.1µF	Foil			653632
C103	334pF	Polystyrene	(25 - 68 Mc/s)	125V ± 1%	PQ10720
*	75pF	Polystyrene	(68 -174 Mc/s)	125V ± 1%	PQ08352
or	80pF	Polystyrene	(68 -174 Mc/s)	125V ± 1%	PQ08380
C104	0.1µF	Foil			653632
C105	18pF	Silver mica		350V ±1pF	660835
C106	204pF	Polystyrene	(25 - 68 Mc/s)	125V ± 1%	PQ10020
*	57pF	Polystyrene	(68 -174 Mc/s)	125V ± 1%	PQ07320
or	60pF	Polystyrene	(68 -174 Mc/s)	125V ± 1%	PQ07600
C107	0.1µF	Foil			653632
C108	204pF	Polystyrene	(25 - 68 Mc/s)	125V ± 1%	PQ10020
*	57pF	Polystyrene	(68 -174 Mc/s)	125V ± 1%	PQ07320
or	60pF	Polystyrene	(68 -174 Mc/s)	125V ± 1%	PQ07600
C109	18pF	Silver mica		350V ±1pF	660835
C110	204pF	Polystyrene	(25 - 68 Mc/s)	125V ± 1%	PQ10020
*	57pF	Polystyrene	(68 -174 Mc/s)	125V ± 1%	PQ07320
or	60pF	Polystyrene	(68 -174 Mc/s)	125V ± 1%	PQ07600
C111	0.1µF	Foil			653632
C112	204pF	Polystyrene	(25 - 68 Mc/s)	125V ± 1%	PQ10020
*	57pF	Polystyrene	(68 -174 Mc/s)	125V ± 1%	PQ07320
or	60pF	Polystyrene	(68 -174 Mc/s)	125V ± 1%	PQ07600
C113	12pF	Silver mica		350V ±1pF	660856
C114	370pF	Polystyrene	(25 - 68 Mc/s)	125V ± 1%	PQ10868
*	110pF	Polystyrene	(68 -174 Mc/s)	125V ± 1%	PQ08655
or	106pF	Polystyrene	(68 -174 Mc/s)	125V ± 1%	PQ08530
C115	0.1µF	Foil			653632
C116	30µF	Electrolytic		15V	266597
C117 to C119		Not used			
C120		Not used	(25 - 68 Mc/s)		
	33pF	Ceramic	(68 - 88 Mc/s)	± 5%	PN12078
		Not used	(88 -108 Mc/s)		
		Not used	(108-132 Mc/s)		
		Not used	(132-156 Mc/s)		
	33pF	Ceramic	(148-174 Mc/s)		PN12078
	33pF	Ceramic	(79 -101 Mc/s)		PN12078
C121	0.1µF	Foil			PQ32000
C122	0.1µF	Foil			PQ32000

Code	RESISTORS				Part No.
R101	33kΩ	Composition		0.1W ±10%	267472
R102	4.7kΩ	Composition		0.1W ±10%	267462
R103	1.8kΩ	Composition		0.1W ±10%	267457
R104	1kΩ	Composition	(25 - 68 Mc/s)	0.1W ±10%	267454
	820Ω	Composition	(68 -174 Mc/s)	0.1W ± 5%	NE82103
R105	33kΩ	Composition		0.1W ±10%	267472
R106	4.7kΩ	Composition		0.1W ±10%	267462
R107	270Ω	Composition		0.1W ±10%	267447
R108	2.2kΩ	Composition		0.1W ±10%	267458
R109	1kΩ	Composition	(25 - 68 Mc/s)	0.1W ±10%	267454
	820Ω	Composition	(68 -174 Mc/s)	0.1W ± 5%	NE82103
R110	33kΩ	Composition		0.1W ±10%	267472
R111	4.7kΩ	Composition		0.1W ±10%	267462
R112	2.7kΩ	Composition		0.1W ±10%	267459
R113	1kΩ	Composition	(25 - 68 Mc/s)	0.1W ±10%	267454
	820Ω	Composition	(68 -174 Mc/s)	0.1W ± 5%	NE82103
R114	220Ω	Composition		0.1W ±10%	267446

SEMICONDUCTORS

VT101	Transistor OC171	865344
VT102	Transistor OC171	865344
VT103	Transistor OC171	865344

TRANSFORMERS

T101	I.F.	278583
T102	I.F.	278583/1
T103	I.F.	278583/1
T104	I.F.	278583/3

INDUCTORS

L101	Coupling coil		278583/2
L102	Coupling coil		278583/2
L103	Not used	(25 - 68 Mc/s)	
	R.F. choke	(68 - 88 Mc/s)	278582
	Not used	(88 -108 Mc/s)	
	Not used	(108-132 Mc/s)	
	Not used	(132-156 Mc/s)	
	R.F. choke	(148-174 Mc/s)	278582
	R.F. choke	(79 -101 Mc/s)	278582

COMPLETE PRINTED CIRCUIT BOARD ASSEMBLIES PART NOS.

(25 - 68 Mc/s) 276251/1 (68 -174 Mc/s) 276251

* Selected on manufacture

SECOND MIXER UNIT

Code	CAPACITORS		Part No.
C201	33pF Silver mica	350V ±1pF	660847
C202	0.1μF Foil		653632
C203	220pF Silver mica	200V ± 2%	660865
C204	100pF Silver mica	350V ± 2%	660857
C205	390pF Silver mica	350V ± 2%	664587
C206	0.1μF Foil		653632
C207	39pF Silver mica	350V ±1pF	660864
C208	30μF Electrolytic	15V	266597
C209	10nF Foil		PQ25000
C210	0.1μF Foil		653632

Code	RESISTORS			Part No.
R201	470Ω	Composition	0.1W ±10%	267450
R202	1.5kΩ	Composition	0.1W ±10%	NG15203
R203	1kΩ	Composition	0.1W ±10%	267454
R204	27kΩ	Composition	0.1W ±10%	267471
R205	27kΩ	Composition	0.1W ±10%	267471
R206	470Ω	Composition	0.1W ±10%	267450
R207	15kΩ	Composition	0.1W ±10%	267468
R208	1.2kΩ	Composition	0.1W ±10%	267455
R209	2.2kΩ	Composition	0.1W ±10%	267458
R210	470Ω	Composition	0.1W ±10%	267450

Code	SEMICONDUCTORS		Part No.
VT201	Transistor	D524	FV07071
VT202	Transistor	OC171	865344
MR201	Diode	OA73	707804

	TRANSFORMER	
T201	455 kc/s	278578

	INDUCTOR	
L201	Choke	279052

	MISCELLANEOUS	
*XL201	Crystal	
	Bandpass filter (25 kc/s)	260008
	Bandpass filter (50 kc/s)	260040
	Bandpass filter (50 kc/s) (Marine)	260007

COMPLETE PRINTED CIRCUIT BOARD PART NO. 276481

* When ordering crystals please state exact frequency and type required.

SECOND I.F. UNIT

Code	CAPACITORS			Part No.
C301	Not used			
C302	0.1μF	Foil		653632
C303	0.1μF	Foil		653632
C304	0.1μF	Foil		653632
C305	0.1μF	Foil		653532
C306	0.1μF	Foil		653532
C307	100pF	Ceramic	±10%	266287
C308	0.1μF	Foil		653632
C309	1nF	Ceramic	±20%	266290
C310	0.1μF	Foil		653632
C311	0.1μF	Foil		653632
C312	1nF	Ceramic	±20%	266290
C313	0.1μF	Foil		653632
C314	0.1μF	Foil		653632
C315	0.1μF	Foil		653632
C316	0.1μF	Foil		653632
C317	1nF	Ceramic	±20%	266290
C318	100pF	Ceramic	±10%	266287
C319	0.1μF	Foil		653632
C320	0.1μF	Foil		653532
C321	1nF	Ceramic	±20%	266290
C322	1.3nF	Silver mica	350V ± 5%	PP14500
C323	390pF	Silver mica	350V ± 5%	PP10900
C324	0.1μF	Foil		653632
C325	Not used			
C326	5nF	Silver mica	200V ± 5%	PP21000
C327	5nF	Silver mica	200V ± 5%	PP21000
C328	3nF	Tubular	±10%	PR06500
C329	0.1μF	Foil		653632
C330	0.1μF	Foil		653632
C331	0.1μF	Foil		653632
C332	0.1μF	Foil		653632
C333	180pF	Silver mica	350V ± 2%	660892

Code	RESISTORS			Part No.
R301	2.7kΩ	Composition	0.1W ±10%	267459
R302	2.7kΩ	Composition	0.1W ±10%	267459
R303	220Ω	Composition	0.1W ±10%	267446

Code	RESISTORS (Cont.)			Part No.
R304	2.7kΩ	Composition	0.1W ±10%	267459
R305	100Ω	Composition	0.1W ±10%	267442
R306	33kΩ	Composition	0.1W ±10%	267472
R307	4.7kΩ	Composition	0.1W ±10%	267462
R308	1kΩ	Composition	0.1W ±10%	267454
R309	100Ω	Composition	0.1W ±10%	267442
R310	100Ω	Composition	0.1W ±10%	267442
R311	2.7kΩ	Composition	0.1W ±10%	267459
R312	18kΩ	Composition	0.1W ±10%	267469
R313	3.3kΩ	Composition	0.1W ±10%	267460
R314	820Ω	Composition	0.1W ±10%	267453
R315	1kΩ	Composition	0.1W ±10%	267454
R316	2.2kΩ	Composition	0.1W ±10%	267458
R317	2.7kΩ	Composition	0.1W ±10%	267459
R318	12kΩ	Composition	0.1W ±10%	267467
R319	3.3kΩ	Composition	0.1W ±10%	267460
R320	5.6kΩ	Composition	0.1W ±10%	267463
R321	2.2kΩ	Composition	0.1W ±10%	267458
R322	100Ω	Composition	0.1W ±10%	267442
R323	33kΩ	Composition	0.1W ±10%	267472
R324	4.7kΩ	Composition	0.1W ±10%	267462
R325	560Ω	Composition	0.1W ±10%	267451
R326	Not used			
R327	1kΩ	Composition	0.1W ±10%	267454
R328	56kΩ	Composition	0.1W ±10%	267475
R329	2.7kΩ	Composition	0.1W ±10%	267459
R330	Not used			
R331	270Ω	Composition	0.1W ±10%	267447
R332	4.7kΩ	Composition 25 kc/s	0.1W ±10%	267462
	1.8kΩ	Composition 50 kc/s	0.1W ±10%	267457
R333	Not used			
R334	4.7kΩ	Composition	0.1W ±10%	267462
R335	68kΩ	Composition	0.1W ±10%	267476
R336	100Ω	Composition	0.1W ±10%	267442
R337	2.7kΩ	Composition	0.1W ±10%	267459
R338	6.8kΩ	Composition	0.1W ±10%	267464
R339	4.7kΩ	Composition 25 kc/s	0.1W ±10%	267462
	1.8kΩ	Composition 50 kc/s	0.1W ±10%	267457

SECOND I. F. UNIT (Cont.)

Code	SEMICONDUCTORS		Part No.
VT301	Transistor	GET890	865377
VT302	Transistor	OC171	865344
VT303	Transistor	GET890	865377
VT304	Transistor	GET890	865377
VT305	Transistor	OC171	865344
VT306	Transistor	GET890	865377
MR301	Diode	OA200	721601
MR302	Diode	OA200	721601
MR303	Diode	HG1012	FV09002
MR304	Diode	HG1012	FV09002

Code	INDUCTORS	Part No
L301	Choke	279051
L302	Choke	279051
L303	Not used	
L304	Discriminator coil	278646
	TRANSFORMERS	
T301	455 kc/s	278578
T302	455 kc/s	278578/2
T303	Discriminator driver	278578/5

COMPLETE PRINTED CIRCUIT BOARD ASSEMBLY PART NO. 276255

SQUELCH UNIT

Code	CAPACITORS			Part No.
C401	8μF	Electrolytic	25V	266596
C402	25μF	Electrolytic	25V	PS28001
C403	100μF	Electrolytic	25V	266395
C404	0.25μF	Tubular (FM10FRX)	150V	669797
	0.1μF	Foil (marine)		653632
C405	0.1μF	Foil		653632
C406	10nF	Tubular	200V	PR14011
C407	10nF	Tubular	200V	PR14011
C408	100μF	Electrolytic	6V	PS38011
C409	4nF	Tubular	250V	PR08502
C410	100μF	Electrolytic	25V	266395
C411		Not used		
		RESISTORS		
R401	1kΩ	Composition	0.1W ±10%	267454
R402	5.6kΩ	Composition	0.1W ±10%	267463
R403	2.7kΩ	Composition	0.1W ±10%	267459
R404	100kΩ	Composition	0.1W ±10%	267478

Code	RESISTORS (Cont.)			Part No.
R405	4.7kΩ	Composition	0.1W ±10%	267462
R406	39kΩ	Composition	0.1W ±10%	267473
R407	3.3kΩ	Composition	0.1W ±10%	267460
R408	1.8kΩ	Composition	0.1W ±10%	267457
R409	820Ω	Composition	0.1W ±10%	267453
R410	2.7kΩ	Composition	0.1W ±10%	267459
R411	10kΩ	Composition	0.1W ±10%	267466
RV2	5kΩ	Potentiometer (SQUELCH control)		281149
		SEMICONDUCTORS		
VT401		Transistor NKT264		FV0609
VT402		Transistor NKT223A		865496
VT403		Transistor NKT223A		865496
		INDUCTOR		
L401		Choke		279836

COMPLETE PRINTED CIRCUIT BOARD ASSEMBLY PART NO. 276484

SQUELCH RELAY DRIVER UNIT

Code	RESISTORS			Part No.
R601	2.2kΩ	Composition	0.1W ±10%	267458
R602	180Ω	Composition	0.1W ±10%	267445
R603	220Ω	Composition	0.1W ±10%	267446
R604	1.2kΩ	Composition	0.1W ±10%	267455
R605	3.9kΩ	Composition	0.1W ±10%	267461
R606	1.8kΩ	Composition	0.1W ±10%	267457
R607	2.7kΩ	Composition	0.1W ±10%	267459
R608	1kΩ	Composition	0.1W ±10%	267454
R609	1.5kΩ	Composition	0.1W ±10%	267456
R610	1kΩ	Composition	0.1W ±10%	267454
R611	680Ω	Composition	0.1W ±10%	267452
R612	100Ω	Composition	0.1W ±10%	267442
R613	220Ω	Composition	0.1W ±10%	267446
R614	4.7kΩ	Composition	0.1W ±10%	267462
R615	100Ω	Composition	0.1W ±10%	267442
R616	680Ω	Composition	0.1W ±10%	267452
R617	330Ω	Composition	0.1W ±10%	267448

Code	RESISTORS (Cont.)			Part No.
R618	10kΩ	Composition	0.1W ±10%	267466
R619	220Ω	Composition	0.1W ±10%	267446
R620	15Ω	Composition	0.1W ±10%	267432
R621	560Ω	Composition	¼W ±10%	671503
		SEMICONDUCTORS		
VT601		Transistor OC200		286070
VT602		Transistor OC200		286070
VT603		Transistor OC200		286070
VT604		Transistor OC200		286070
VT605		Transistor 2S701		865368
VT606		Transistor OC204		FV05005
MR601		Diode OA200		721601

COMPLETE PRINTED CIRCUIT BOARD ASSEMBLY PART NO. 276481

AUDIO SECTION

Code		CAPACITORS		Part No.
C501 to C507		Not used		
C508	25µF	Electrolytic	12V	PS28005
C509	10nF	Tubular	200V ±10%	PR14000
C510		Not used		
C511		Not used		
C512	2µF	Electrolytic	6V	680426
C513	10nF	Tubular	200V ±10%	PR14000
C514		Not used		
C515		Not used		
C516a	1000µF	Electrolytic	15V	266600
b	1000µF			
C517	0.047µF	Polyester (marine only)		PQ29453
C701	100µF	Electrolytic	15V	266647
C702	0.1µF	Tubular	125V	PR19540
C703	100µF	Electrolytic	6V	266392
C704	1000µF	Electrolytic	6V	266636
C802	8µF	Electrolytic	15V	680430

RESISTORS

R501 to R509		Not used		
R510	10kΩ	Composition	0.1W ±10%	267466
R511	1kΩ	Composition	0.1W ±10%	267454
R512	5.6kΩ	Composition	0.1W ±10%	267463
R513	820Ω	Composition	0.1W ±10%	267453
*R514	22Ω	Composition	0.1W ±10%	267434
	27Ω	Composition	0.1W ±10%	267435
	33Ω	Composition	0.1W ±10%	267436
	39Ω	Composition	0.1W ±10%	267437
	47Ω	Composition	0.1W ±10%	267438
	56Ω	Composition	0.1W ±10%	267439
	68Ω	Composition	0.1W ±10%	267440
	82Ω	Composition	0.1W ±10%	267441
	100Ω	Composition	0.1W ±10%	267442
	120Ω	Composition	0.1W ±10%	267443
	150Ω	Composition	0.1W ±10%	267444
	180Ω	Composition	0.1W ±10%	267445
	220Ω	Composition	0.1W ±10%	267446
R515	18kΩ	Composition	0.1W ±10%	267469
R516	5.6kΩ	Composition	0.1W ±10%	267463
R517	1.5kΩ	Composition	0.1W ±10%	267456
R518	100Ω	Composition	¼W ±10%	671494
R519	3.9kΩ	Composition (marine only)	0.1W ±10%	NG39203

Code		RESISTORS (Cont.)		Part No.
R701	4.7kΩ	Composition	¼W ±10%	671514
R702	15kΩ	Composition	¼W ±10%	671520
R703	4.7kΩ	Composition	¼W ±10%	671514
R704	12kΩ	Composition	¼W ±10%	671519
R705	470kΩ	Composition	¼W ±10%	671538
R706	1kΩ	Composition	¼W ±10%	671506
R707	470Ω	Composition	¼W ±10%	671502
R707 a	470Ω	Composition	¼W ±10%	671502
R708	3.3Ω	Wirewound	±0.2Ω	677196
R709	3.2Ω	Composition	¼W ±10%	671121
RV1	5kΩ	Potentiometer (a.f. gain control)		281147
RV701	25Ω	Potentiometer		281193

SEMICONDUCTORS

VT501	Not used	
VT502	Not used	
VT503	Transistor NKT223A	865496
VT504	Transistor NKT223A	865496
VT701	Transistor OC72	286049
VT702	Transistor OC35	865327

TRANSFORMERS

T701	Audio driver	AL21063
T702	Audio output	AL21062
T703	Line	771305

INDUCTORS

L501	Audio choke	279836/1
L502	Filter choke	279840

* Component selected on manufacture

COMPLETE AUDIO UNIT PRINTED CIRCUIT BOARD ASSEMBLY PART NO. 276482/2

COMPLETE AUDIO DRIVER UNIT PRINTED CIRCUIT BOARD PART NO. 276480

POWER SUPPLY & FRONT PANEL

Code		CAPACITORS			Part No.
C801		Not used (25 -174 Mc/s) (single channel)			
		Not used (79 -101 Mc/s) (single channel)			
	2nF	Disc ceramic (25 - 68 Mc/s) (switched channel)	+40% -20%		660461
		Not used (68 - 88 Mc/s) (switched channel)			
	2nF	Disc ceramic (88 -156 Mc/s) (switched channel)	+40% -20%		660461
		Not used (148-174 Mc/s) (switched channel)			
		Not used (79 -101 Mc/s) (switched channel)			
C802		(See Audio Section)			
C803	2500µF	Electrolytic	25V		PS54000

Code		CAPACITORS (Cont.)			Part No.
C804	8µF	Electrolytic	150V		266652
C805	10pF	Ceramic (25 - 88 Mc/s) (single channel)		±0.5pF	PN09031
	10pF	Ceramic (88 -156 Mc/s) (single channel)		± 5%	PN09031
		Not used (148-174 Mc/s) (single channel)			
		Not used (79 -101 Mc/s) (single channel)			
	4.7pF	Ceramic (25 -148 Mc/s) (switched channel)		±0.5pF	266275
	3.9pF	Ceramic (148-174 Mc/s) (switched channel)		±0.5pF	266499
	4.7pF	Ceramic (79 -101 Mc/s) (switched channel)		±0.5pF	266275

POWER SUPPLY & FRONT PANEL (Cont.)

Code		CAPACITORS (Cont.)		Part No.
C806 to C811		Not used		
C812	2nF	Disc ceramic(25 -174 Mc/s) (single channel)	+40% -20%	660461
	2nF	Disc ceramic(79 -101 Mc/s)	+40% -20%	660461
	2nF	Disc ceramic(25 - 68 Mc/s) (switched channel)	+40% -20%	660461
		Not used (68 - 88 Mc/s) (switched channel)		
	2nF	Disc ceramic(88 -156 Mc/s) (switched channel)	+40% -20%	660461
		Not used (148-174 Mc/s) (switched channel)		
		Not used (79 -101 Mc/s) (switched channel)		

RESISTORS

R801	680Ω	Composition (switched channel only)	¼W ±10%	671504
R802	680Ω	Composition (switched channel only)	¼W ±10%	671504
R803	680Ω	Composition (switched channel only)	¼W ±10%	671504
R804	680Ω	Composition (switched channel only)	¼W ±10%	671504
R805	680Ω	Composition (switched channel only)	¼W ±10%	671504
R806	680Ω	Composition	¼W ±10%	671504
R807	12kΩ	Composition	¼W ±10%	671519
R808	22Ω	Composition	¼W ±10%	671486
R809	2.3Ω	Wirewound	±10%	671112
R810	3.2Ω			
R811	5Ω	Wirewound	±10%	671110
R812	18Ω	Composition	¼W ±10%	671485
R813	22Ω	Composition	¼W ±10%	671486
R814	2.5Ω			
R815	0.7Ω	Wirewound	±10%	671113
R816	0.45Ω			
R817	3.2Ω	Wirewound	±10%	671121

SEMICONDUCTORS

MR801	Diode 4 x OA210	709071
MR802	Diode OA210	709071

TRANSFORMERS

T801	H.T.	AL21064
†T802	Oven heater	AL21067

† Used for two oven operation.

Code		INDUCTORS		Part No.
L801 to L805		Crystal trimming coil (switched channel only)	(25-32.5 Mc/s)	278666/1
		Crystal trimming coil (switched channel only)	(32.5-42 Mc/s)	278666/2
		Crystal trimming coil (switched channel only)	(42 - 54 Mc/s)	278666/3
		Crystal trimming coil (switched channel only)	(54 - 68 Mc/s)	278666/2
		Crystal trimming coil (switched channel only)	(68 - 88 Mc/s)	278666/1
		Crystal trimming coil (switched channel only)	(88 -108 Mc/s)	278666/2
		Crystal trimming coil (switched channel only)	(108-136 Mc/s)	278666/4
		Crystal trimming coil (switched channel only)	(132-156 Mc/s)	278666/3
		Crystal trimming coil (switched channel only)	(148-174 Mc/s)	278666/6
		Crystal trimming coil (switched channel only)	(79 -101 Mc/s)	278508/3
L806		Crystal trimming coil	(25-32.5 Mc/s)	278666/1
		Crystal trimming coil	(32.5-42 Mc/s)	278666/2
		Crystal trimming coil	(42 - 54 Mc/s)	278666/3
		Crystal trimming coil	(54 - 68 Mc/s)	278666/2
		Crystal trimming coil	(68 - 88 Mc/s)	278666/1
		Crystal trimming coil	(88 -108 Mc/s)	278666/2
		Crystal trimming coil	(108-136 Mc/s)	278666/4
		Crystal trimming coil	(132-156 Mc/s)	278666/3
		Crystal trimming coil	(156-174 Mc/s)	278666/6
		Crystal trimming coil	(79 -101 Mc/s)	278508/3
L807		Smoothing choke		AL51050

MISCELLANEOUS

ILP801		Power ON lamp	12V 0.1A	FL01070
ILP802		Crystal oven lamp	12/14V 0.75W	272232
RLA	9000Ω	Switching relay		FR01043
RLB	240Ω	Squelch relay		FR01012
SA		CHANNEL SELECT switch		283584
SB		VOLUME control		283391
SC		ON/OFF switch		283093
LS		Loudspeaker		285010
TS1		Not used		
TS2		Voltage selector plate		274970
TS3		Output terminal strip		701716
		Antenna connector		FS16064
PLJ		Power plug		272110
FS2		Fuse (240V without ovens)	100mA	FF00851
		Fuse (240V with ovens)	150mA	FF00850
		Fuse (110V without ovens)	150mA	FF00850
		Fuse (110V with ovens)	250mA	FF00853
FS3		Fuse	500mA	700487
		Oven (single & switched channel)		271502
*XL801 to XL805		Crystal (switched channel only)		
*XL806		Crystal		

* When ordering crystals, please state exact frequency and type required.

MECHANICAL ITEMS

TRANSMITTER

Description	Part No.
Chromium-plated handle	270622
Chromium-plated washer for handle	230357
Front panel assembly	274954/7
Side plate (left hand)	242418
Side plate (right hand)	242419
Front panel retaining screws (2B.A. x $\frac{5}{8}$ in)	238116
Front panel retaining screw cup washer	230795
Tie rod	230952
3D Pye medallion	270210
Escutcheon	248305/1
Escutcheon for switched channel	248306/1
Indicator lampholder (power on)	272253
Indicator lampholder (oven cycling)	272244
Knob	272258
Grub screw for knob	238117
Crystal holder (single crystal)	271498
Retaining clip (single crystal)	271357
Crystal holder (3-crystals)	274476
Retaining clip (3-crystals)	271885
Crystal base assembly for crystal oven	271501
Crystal oven	271502
Crystal oven clip	271503
Retaining clip for coil screening can	271230
B7G chassis mounting socket	272341
Stub shaft assembly)	275060
Locking nut 3/8 in.) Switched channel	310441/A
Switch bush)	230302
Switch stop)	242421
Valveholder B7G ceramic with skirt	271516
Valveholder B9A ceramic without skirt	705995
Valveholder B9A ceramic with skirt	271523
Valveholder B7A	701132
Valveholder international octal	705971
Valve screening can B7G	706312
Valve screening can B9A	706315

TRANSMITTER POWER SUPPLY UNIT

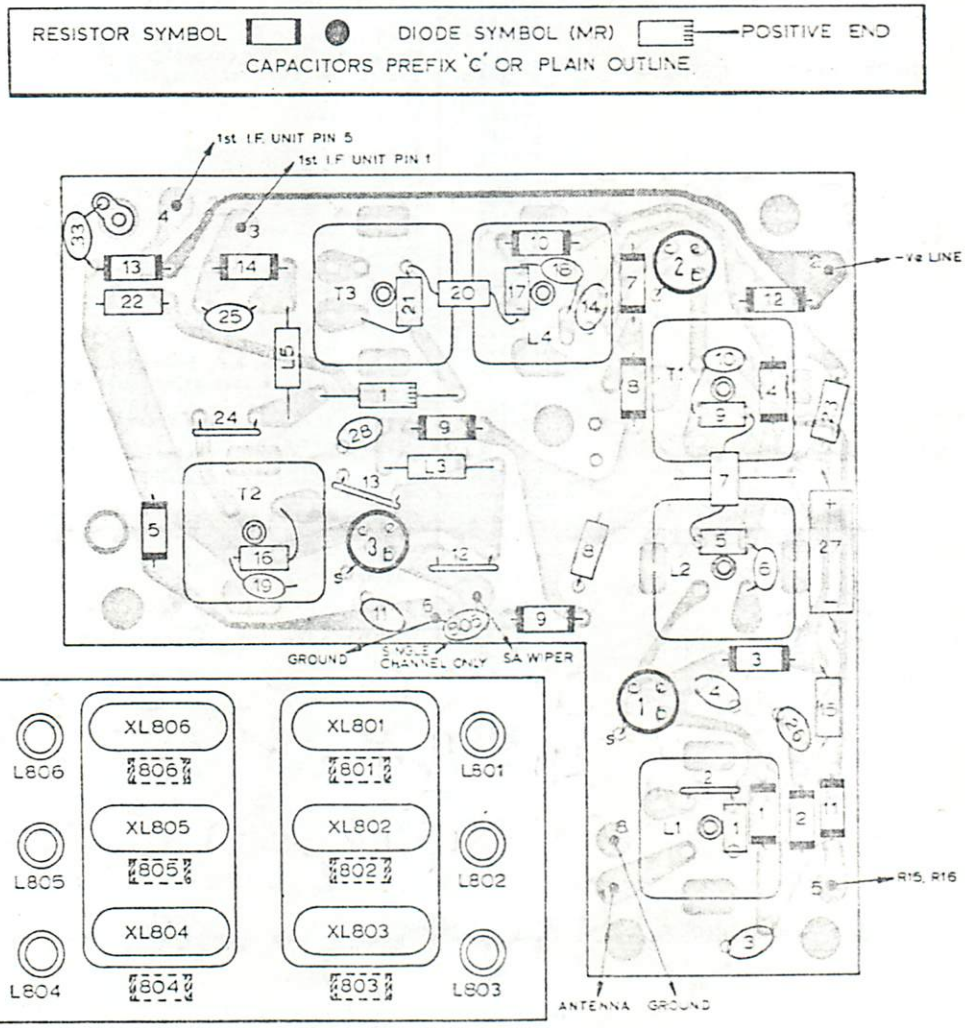
Description	Part No.
Microphone gain control lock	208141
Line gain control lock	208141

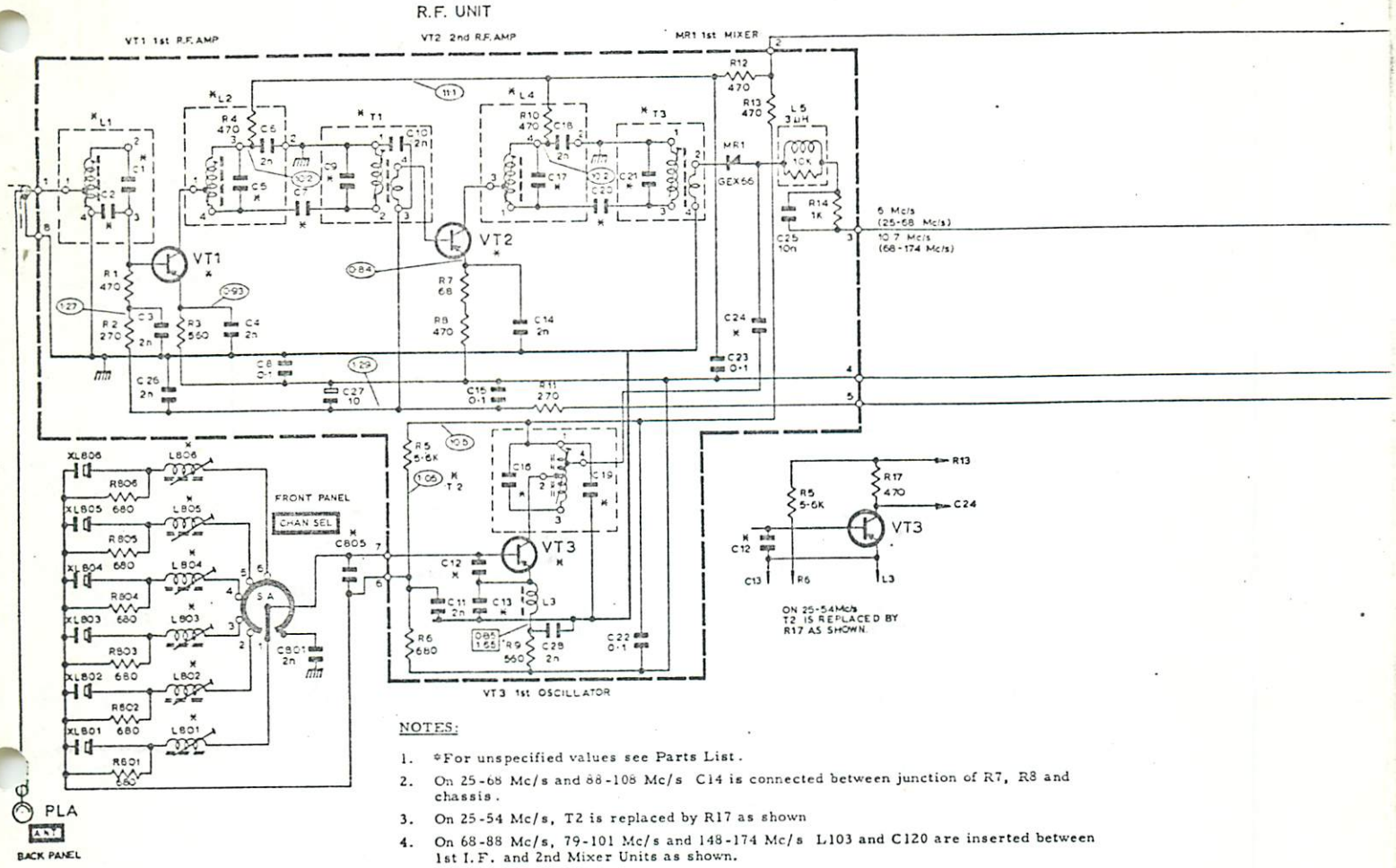
TRANSMITTER POWER SUPPLY UNIT (Cont.)

Description	Part No.
Fuseholder (Power input)	710168
Fuseholder (H.T.)	710632
Backing plate for TS3	242455/A

RECEIVER

Description	Part No.
Front panel (single channel)	276560
Front panel (switched channel)	276560/1
Knob	272058
Set screw	238117
Pye Medallion	270210
Handles	270622
Escutcheon (single channel)	248307
Escutcheon (switched channel)	248308
Speaker grille	271945
Lens, green	273562
Screen assembly (top)	276562
Screen assembly (bottom)	276563
Bracket assembly (for top screen)	276564
L Bracket (for bottom screen)	244574
Springs for L bracket	243045
Spindle lock	208141
Spindle lock cover	208142
Voltage selector plate	276401
Fuse holder	710168
Crystal retaining spring	271885
Hexagon post (1st I.F. Board)	231286
Hexagon post (Voltage selector plate)	310618
Support (Audio & 2nd I.F. Board)	244570
Hexagon post (remaining boards)	231251
Crystal oven clip	271503
Insulating bush for transistors	270682
Grommet $\frac{1}{4}$ in	271702
Grommet 3/8 in	271200
Capacitor clip 3/8 in	700651
Capacitor clip 3/8 in	700653
Capacitor clip 1 in	700655

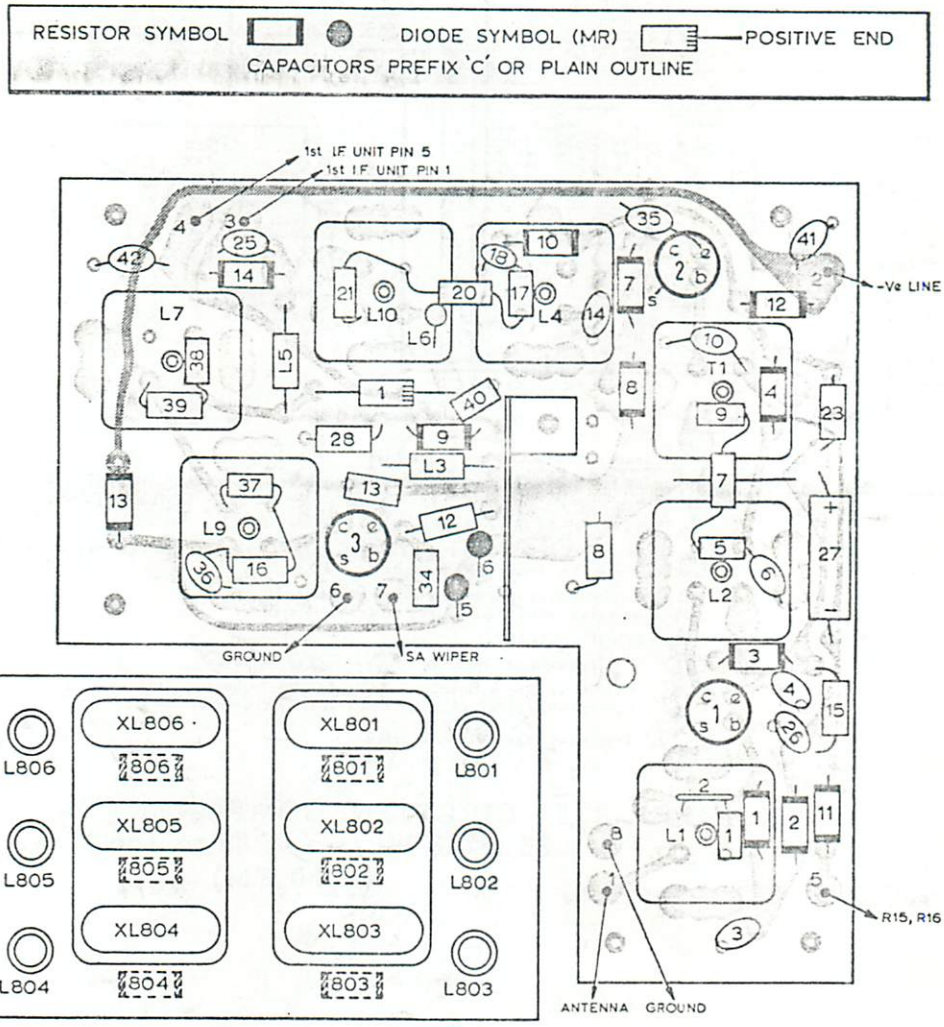

RESISTOR SYMBOL
DIODE SYMBOL (MR)
POSITIVE END
CAPACITORS PREFIX 'C' OR PLAIN OUTLINE
1st. I.F. UNIT PIN 5
1st. I.F. UNIT PIN 1
-Ve LINE
GROUND
S. MALE CHANNEL ONLY
SA WIPER
ANTENNA
GROUND
R15, R16
XL806
XL805
XL804
XL801
XL802
XL803
L806
L805
L804
L801
L802
L803
T1
T2
T3
L1
L2
L3
L4
L5



NOTES:

1. *For unspecified values see Parts List.
2. On 25-68 Mc/s and 88-108 Mc/s C14 is connected between junction of R7, R8 and chassis.
3. On 25-54 Mc/s, T2 is replaced by R17 as shown
4. On 68-88 Mc/s, 79-101 Mc/s and 148-174 Mc/s L103 and C120 are inserted between 1st I.F. and 2nd Mixer Units as shown.
5. All resistors quoted in Ω unless otherwise stated.
   All capacitors quoted in μF unless otherwise stated.
6. 1nF = 1000pF = 0.001μF.
7. (7.6) Typical voltage, negative with respect to chassis
   (0.5 / 3.6) Typical voltage with squelch control fully clockwise / Typical voltage with squelch con trol fully counterclockwise.
   (4.7) Typical voltages XL102 shorted.

Fig. 12 (a) RECEIVER R.F. CIRCUIT & COMPONENT LOCATION DIAGRAM
25 to 68 Mc/s and 88 to 156 Mc/s
(F 60 FM)


RESISTOR SYMBOL
DIODE SYMBOL (MR)
POSITIVE END
CAPACITORS PREFIX 'C' OR PLAIN OUTLINE
1st I.F. UNIT PIN 5
1st I.F. UNIT PIN 1
-Ve LINE
GROUND
SA WIPER
ANTENNA
GROUND
R15, R16
L7
L10
L6
L4
L5
L3
L9
T1
L2
L1
XL806
XL805
XL804
XL801
XL802
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L805
L804
L801
L802
L803

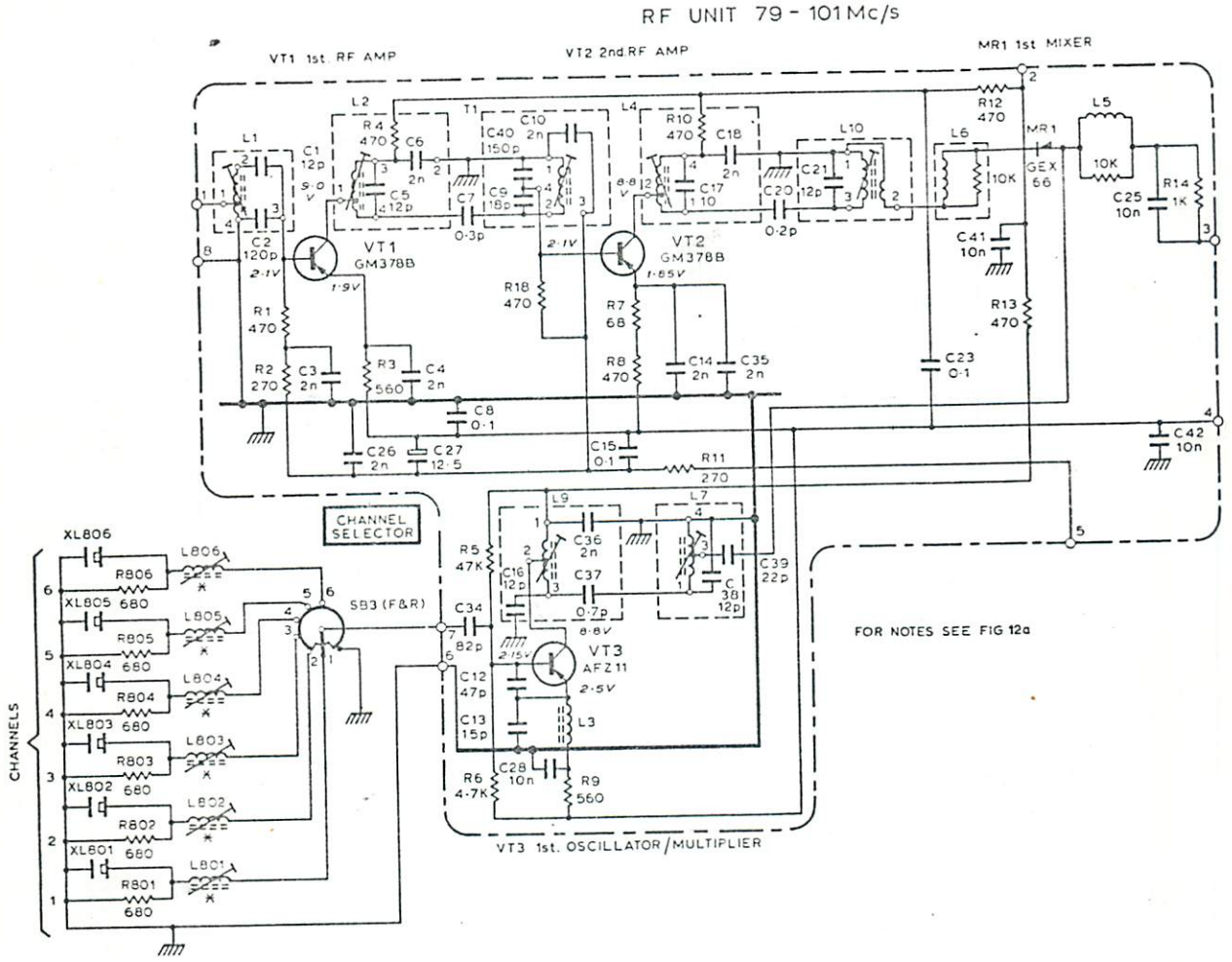
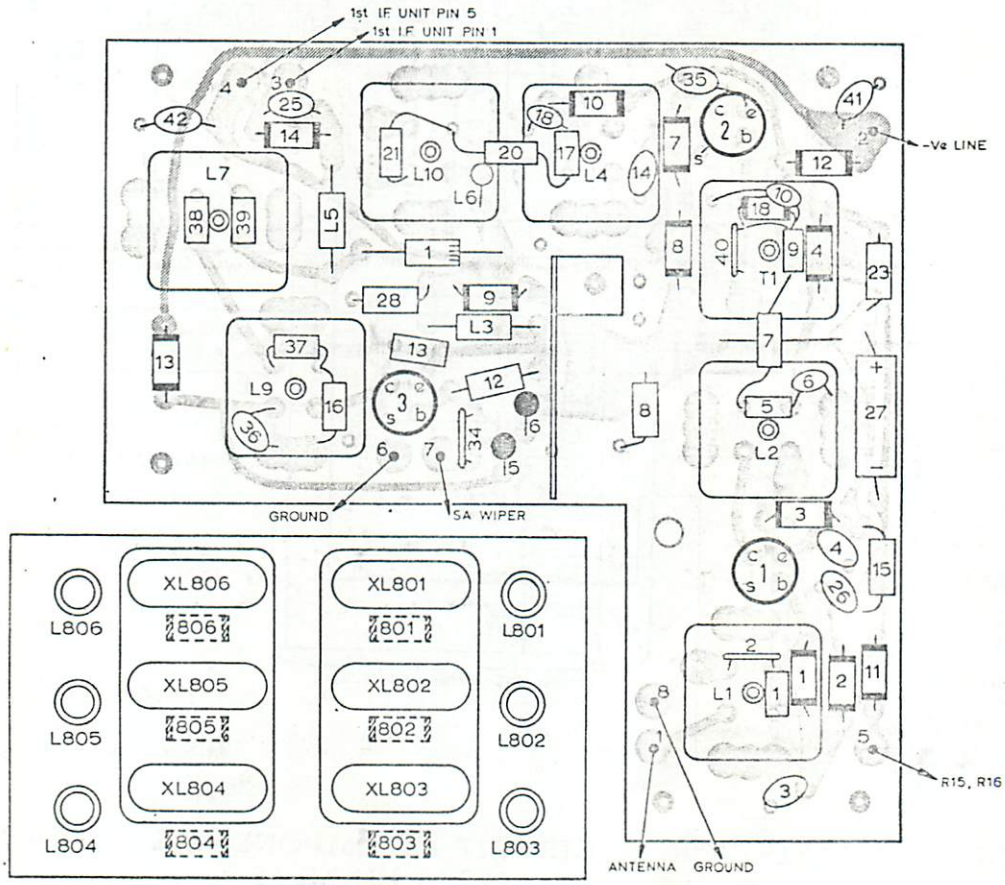
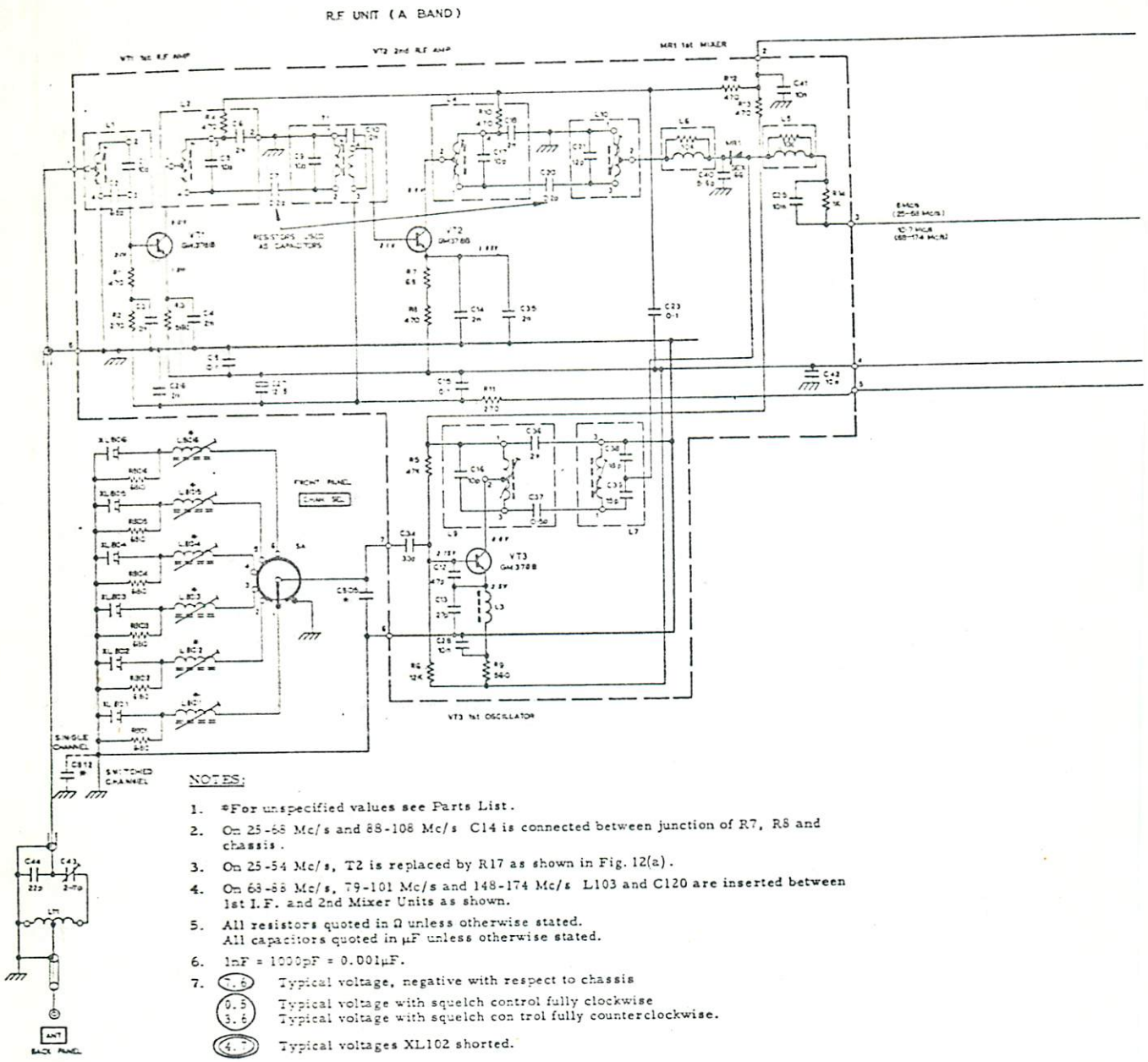


Fig. 12 (b) RECEIVER R. F. CIRCUIT & COMPONENT LOCATION DIAGRAM
79 to 101 Mc/s
(F 60 FM)

RESISTOR SYMBOL DIODE SYMBOL (MR) POSITIVE END

CAPACITORS PREFIX 'C' OR PLAIN OUTLINE

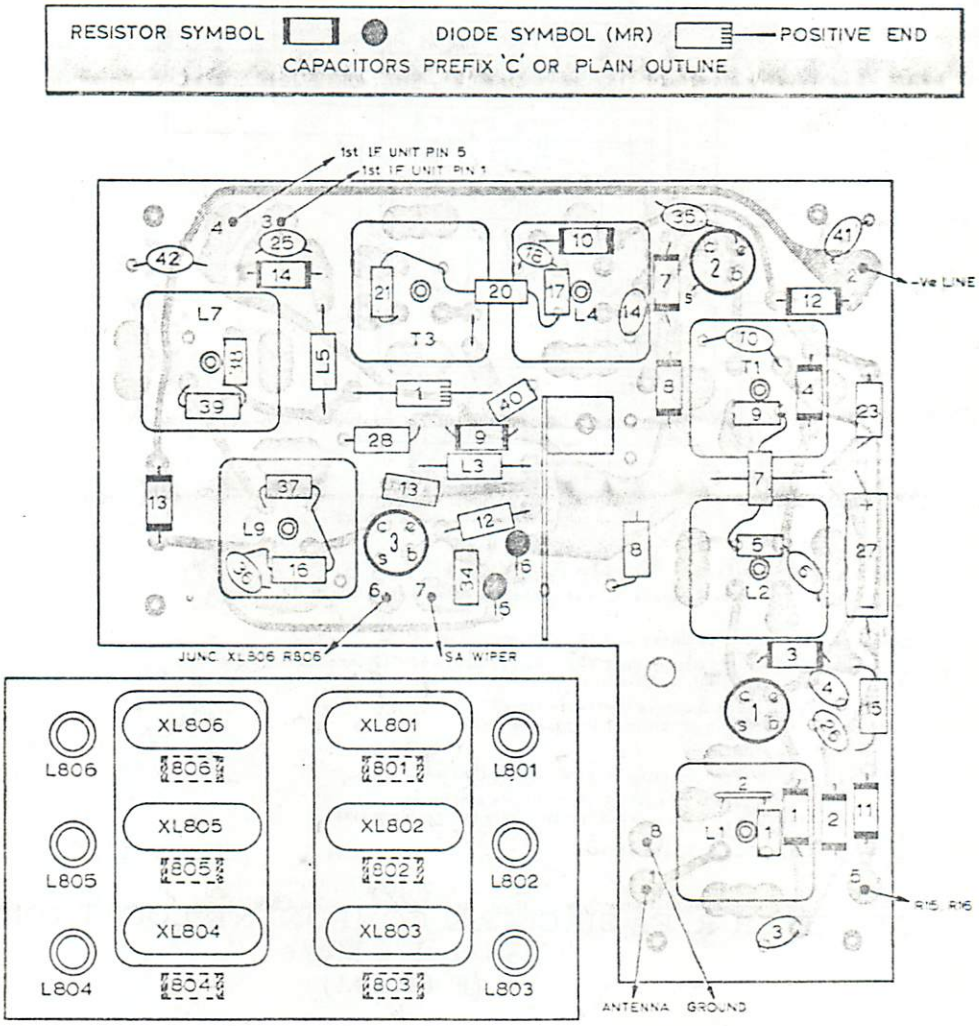


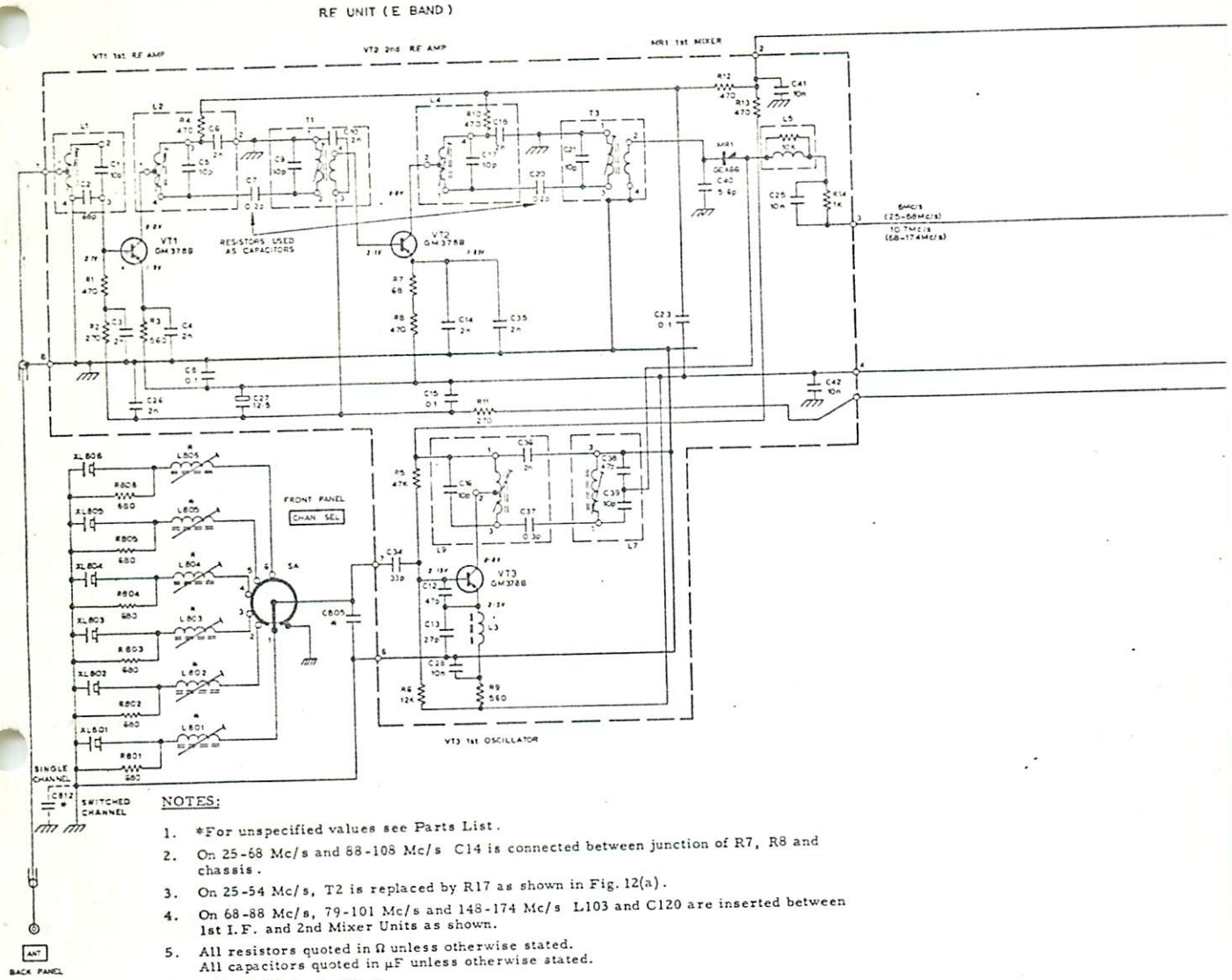


NOTES:

1. *For unspecified values see Parts List.
2. On 25-68 Mc/s and 88-108 Mc/s C14 is connected between junction of R7, R8 and chassis.
3. On 25-54 Mc/s, T2 is replaced by R17 as shown in Fig. 12(a).
4. On 68-88 Mc/s, 79-101 Mc/s and 148-174 Mc/s L103 and C120 are inserted between 1st I.F. and 2nd Mixer Units as shown.
5. All resistors quoted in Ω unless otherwise stated.
   All capacitors quoted in μF unless otherwise stated.
6. 1nF = 1000pF = 0.001μF.
7. (7.5) Typical voltage, negative with respect to chassis
   (0.5 / 3.6) Typical voltage with squelch control fully clockwise / Typical voltage with squelch con trol fully counterclockwise.
   (4.7) Typical voltages XL102 shorted.

Fig. 12 (c) RECEIVER R. F. CIRCUIT & COMPONENT LOCATION DIAGRAM
148 to 174 Mc/s
(F 60 FM)


RESISTOR SYMBOL
DIODE SYMBOL (MR)
POSITIVE END
CAPACITORS PREFIX 'C' OR PLAIN OUTLINE
1st IF UNIT PIN 5
1st IF UNIT PIN 1
-Ve LINE
JUNC XL806 R806
SA WIPER
ANTENNA
GROUND
R15, R16
XL806
XL805
XL804
XL801
XL802
XL803
L806
L805
L804
L801
L802
L803
L7
L5
T3
L4
T1
L3
L9
L2
L1



NOTES:

1. *For unspecified values see Parts List.
2. On 25-68 Mc/s and 88-108 Mc/s C14 is connected between junction of R7, R8 and chassis.
3. On 25-54 Mc/s, T2 is replaced by R17 as shown in Fig. 12(a).
4. On 68-88 Mc/s, 79-101 Mc/s and 148-174 Mc/s L103 and C120 are inserted between 1st I.F. and 2nd Mixer Units as shown.
5. All resistors quoted in Ω unless otherwise stated.
   All capacitors quoted in μF unless otherwise stated.
6. 1nF = 1000pF = 0.001μF.
7. (7.6) Typical voltage, negative with respect to chassis
   (0.5 / 3.6) Typical voltage with squelch control fully clockwise / Typical voltage with squelch con trol fully counterclockwise.
   (4.7) Typical voltages XL102 shorted.

Fig. 12 (d) RECEIVER R. F. CIRCUIT & COMPONENT LOCATION DIAGRAM
68 to 88 Mc/s
(F 60 FM)

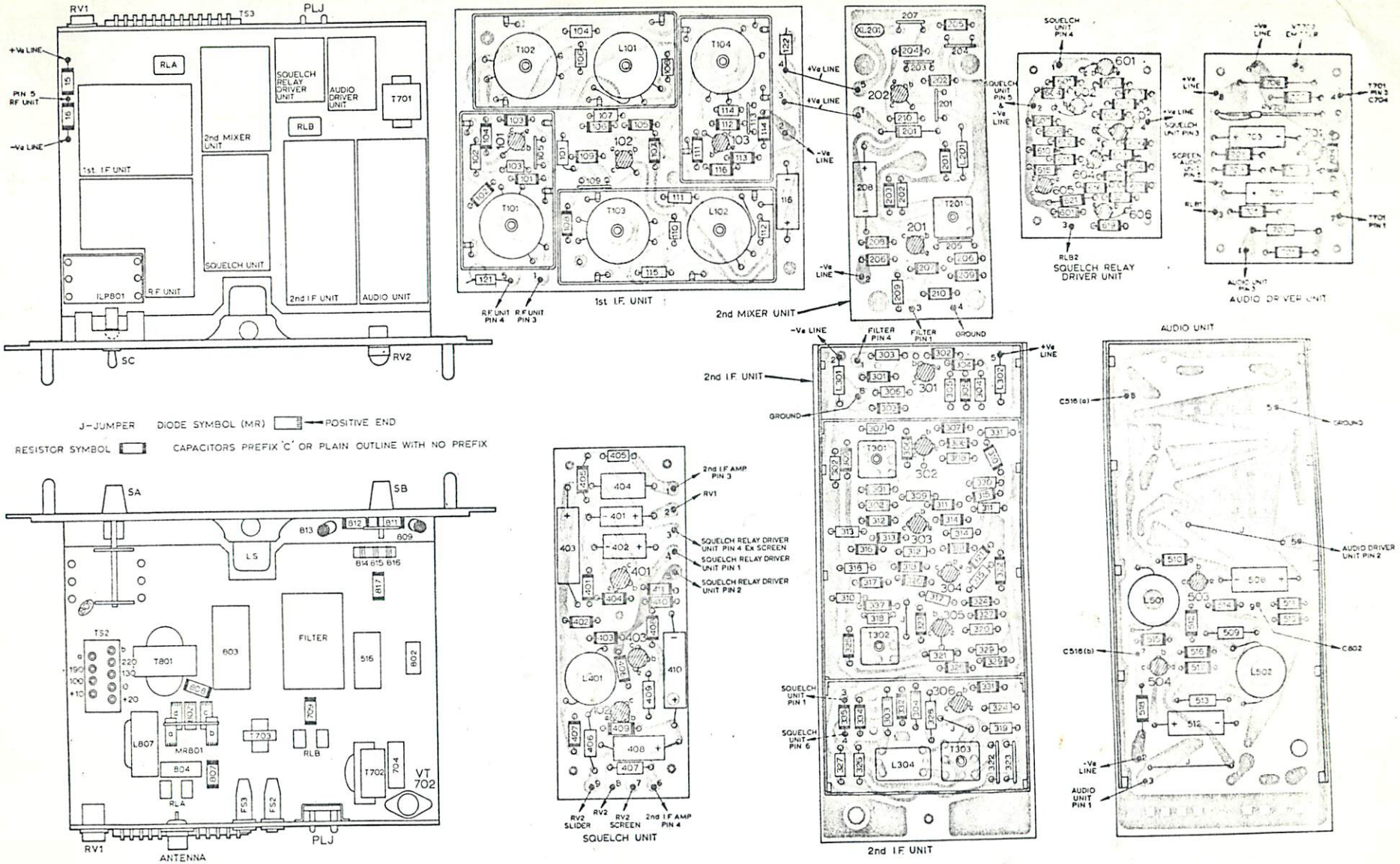


Fig.13 RECEIVER COMPONENT LAYOUT DIAGRAM (F 60 FM)

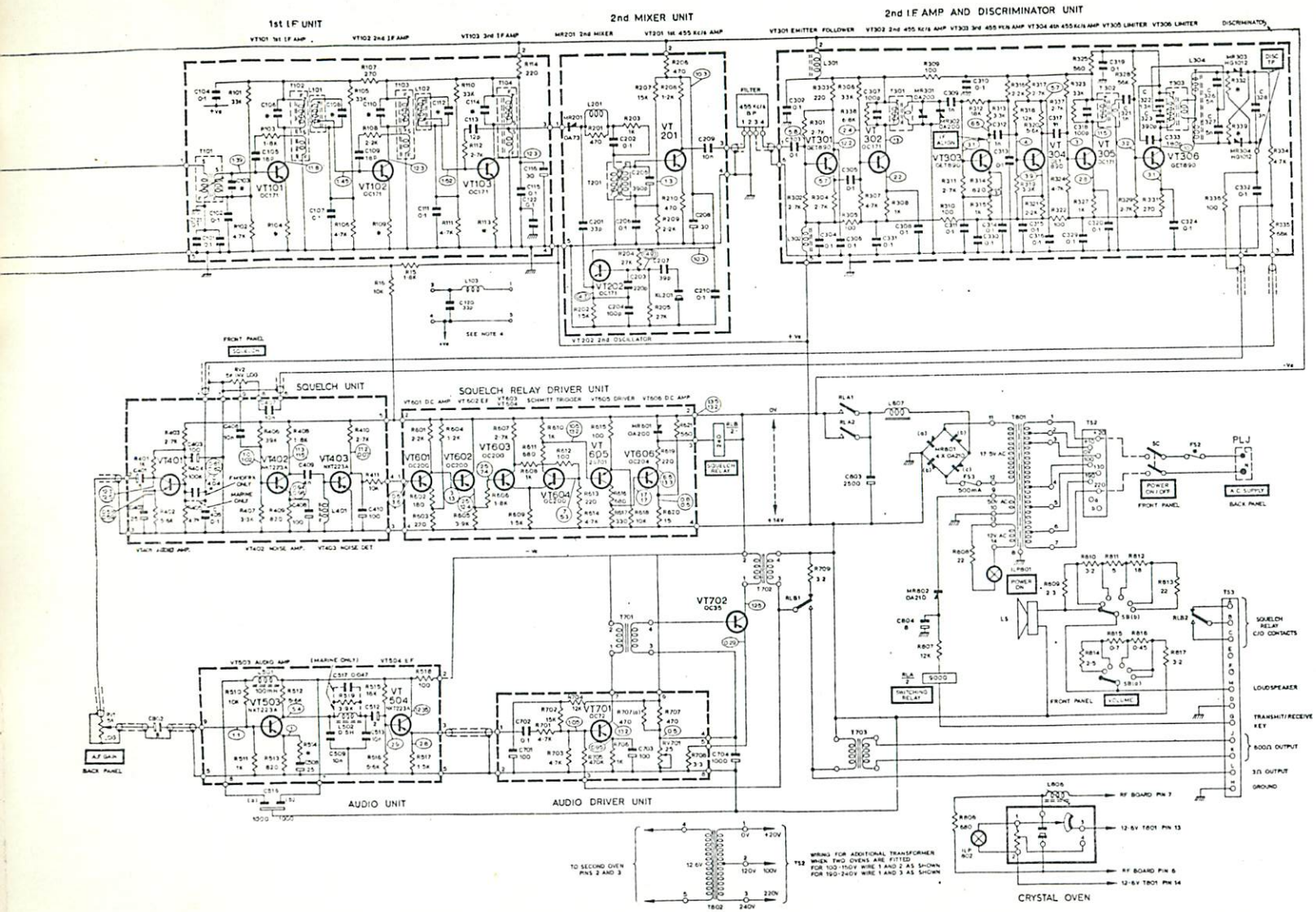
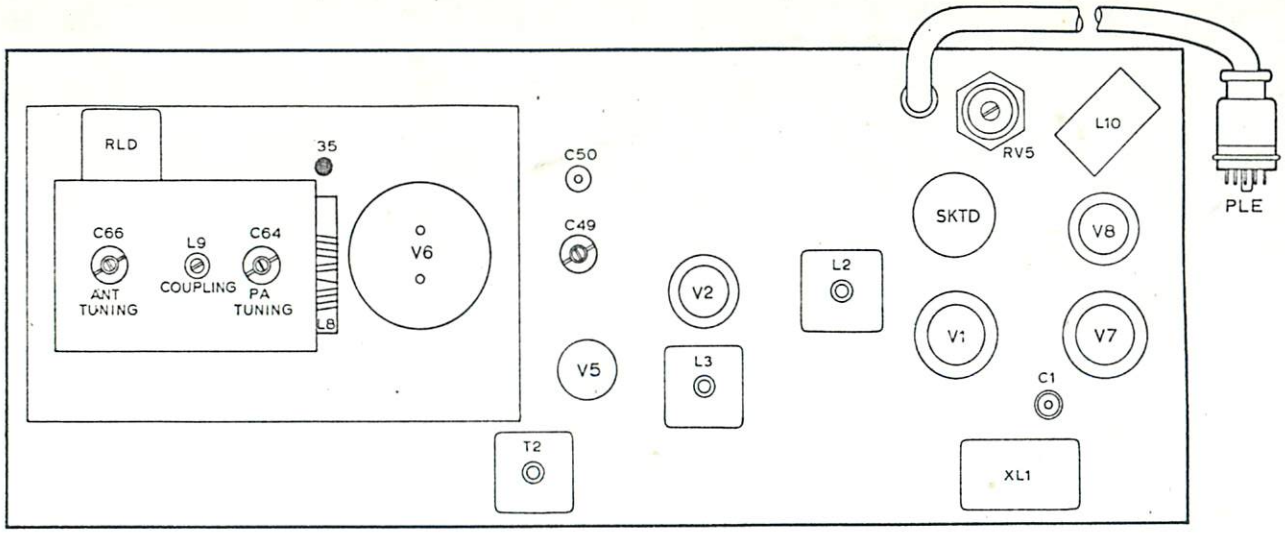


Fig.14 RECEIVER CIRCUIT DIAGRAM
(F 60 FM)



RESISTOR SYMBOL ▭ CAPACITOR PREFIX 'C' OR PLAIN OUTLINE WITH NO PREFIX

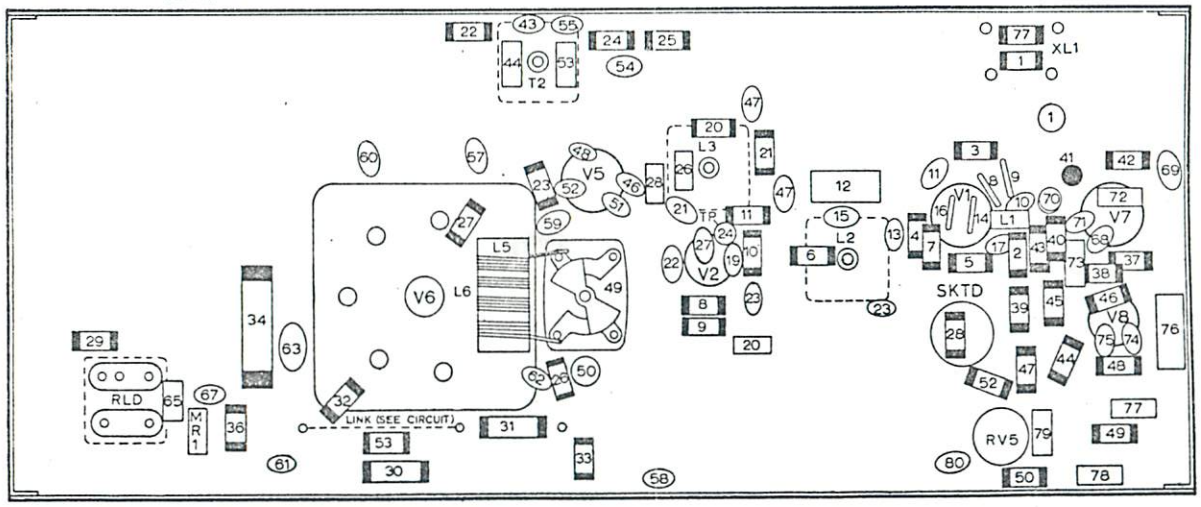


Fig.15 TRANSMITTER COMPONENT LAYOUT DIAGRAM - 25 to 68 Mc/s (F 60 FM)

PREFIX USED THROUGHOUT TEXT TO IDENTIFY COMPONENTS IN THIS CIRCUIT (1)

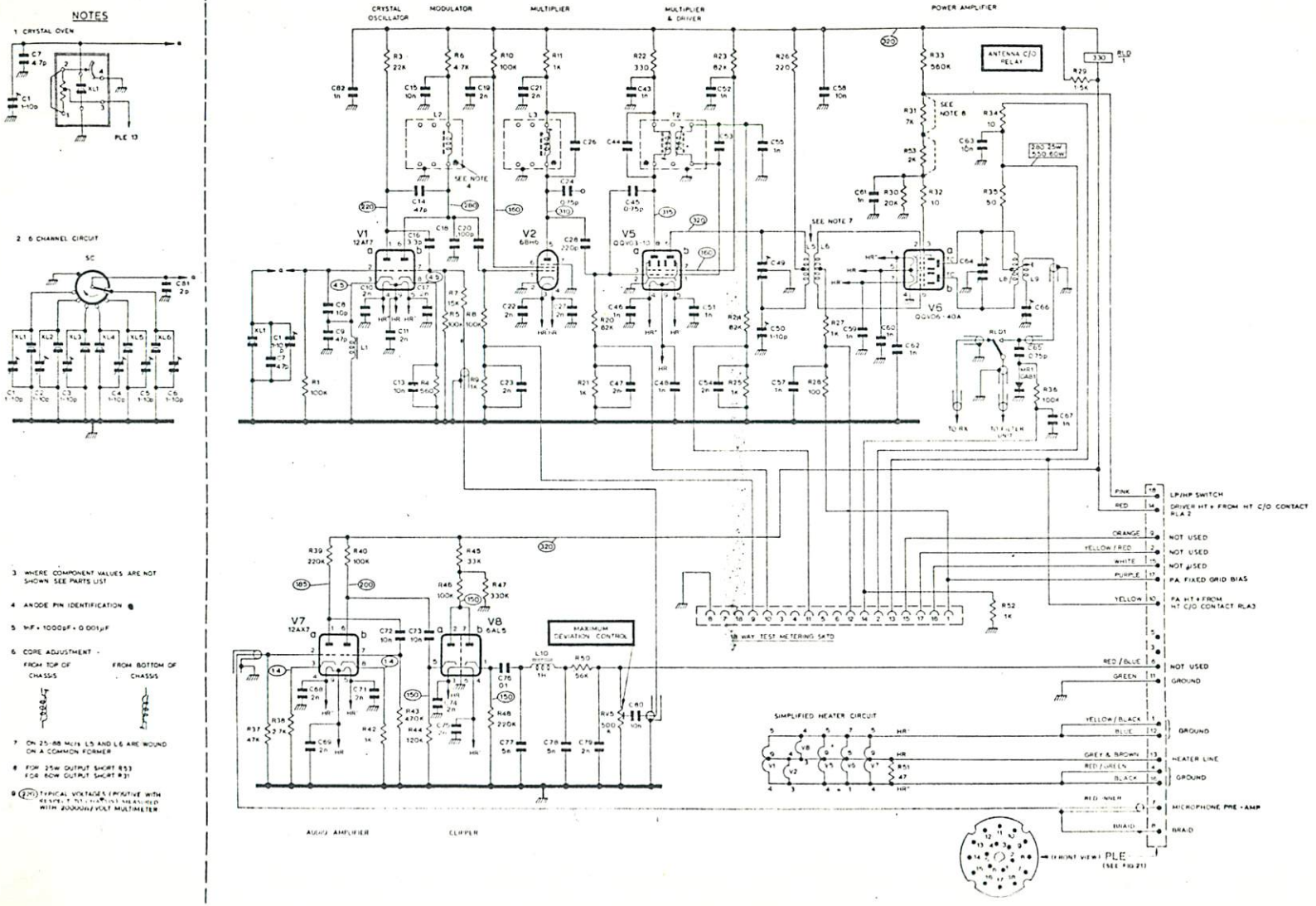
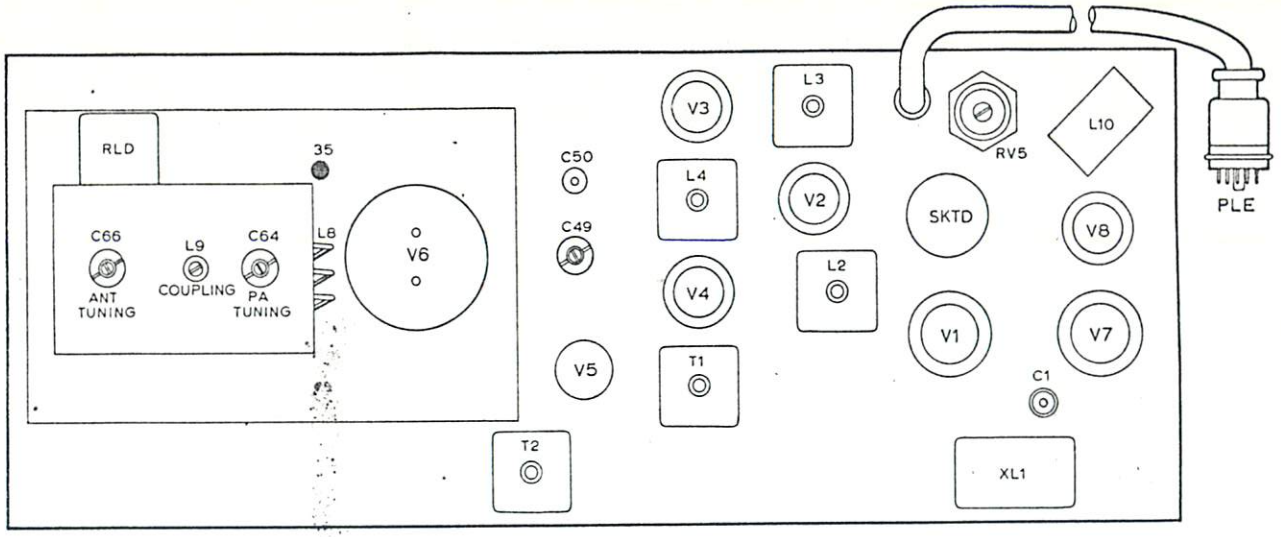


Fig. 16 TRANSMITTER CIRCUIT DIAGRAM - 25 to 68 Mc/s (F 60 FM)



RESISTOR SYMBOL ▭ CAPACITOR PREFIX 'C' OR PLAIN OUTLINE WITH NO PREFIX

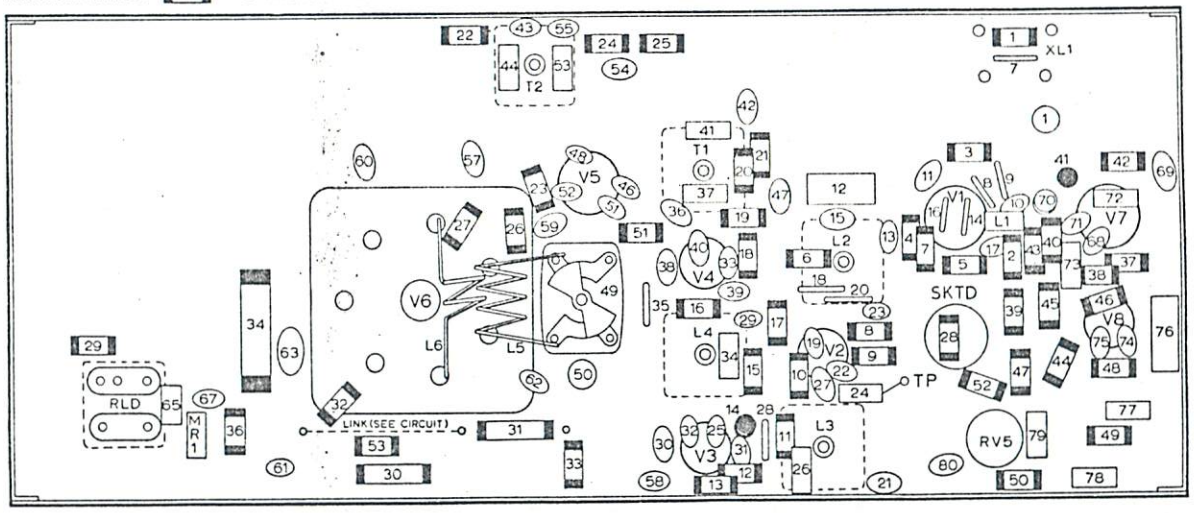


Fig. 17 TRANSMITTER COMPONENT LAYOUT DIAGRAM - 68 to 174 Mc/s (F 60 FM)

PREFIX USED THROUGHOUT TEXT TO IDENTIFY COMPONENTS IN THIS CIRCUIT (1)

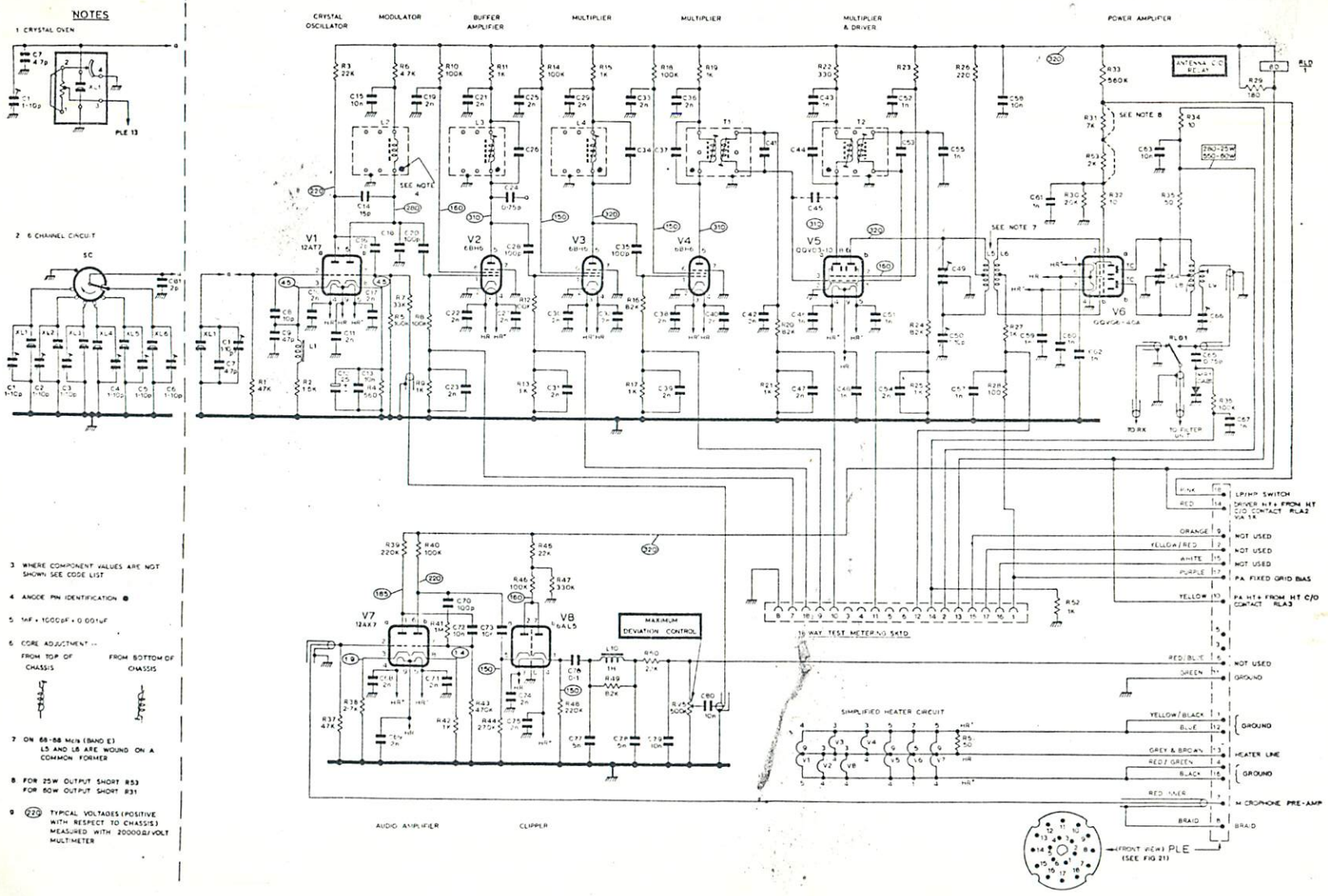


Fig. 18 TRANSMITTER CIRCUIT DIAGRAM - 68 to 174 Mc/s (F 60 FM)

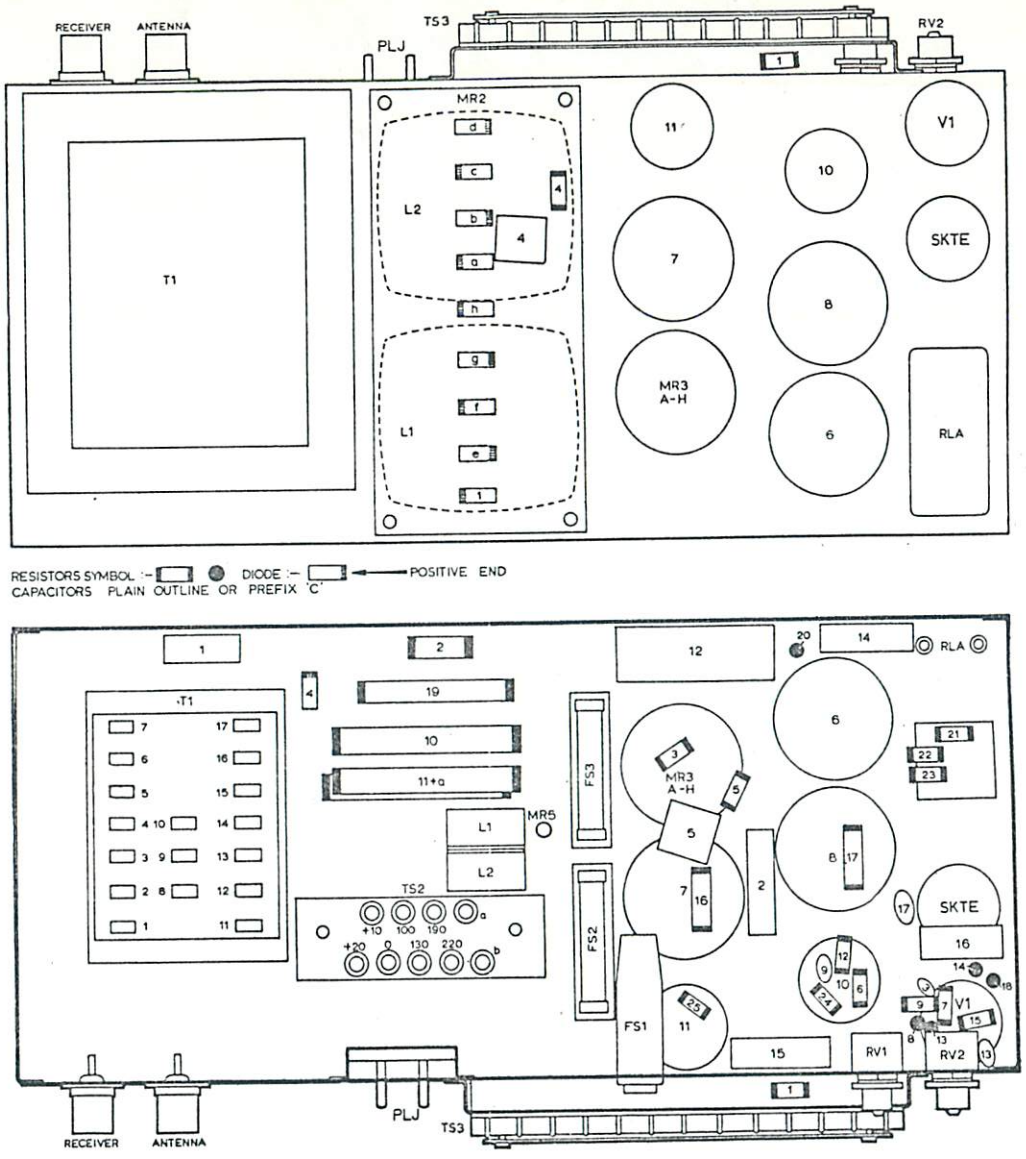


Fig.19 TRANSMITTER POWER SUPPLY UNIT COMPONENT LAYOUT DIAGRAM
(F 60 FM)

PREFIX USED THROUGHOUT TEXT TO IDENTIFY COMPONENTS IN THIS CIRCUIT (2)

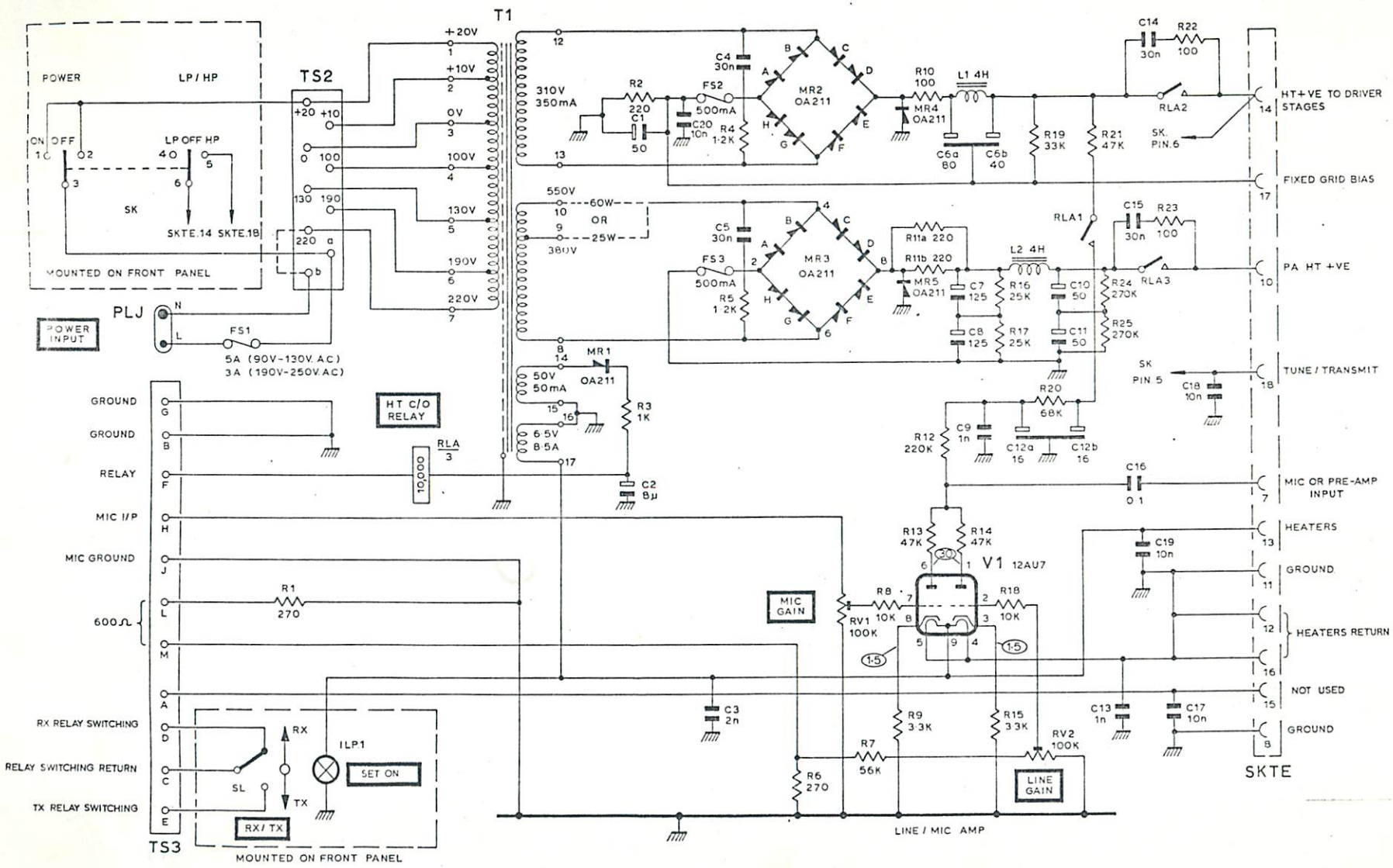


Fig.20 TRANSMITTER POWER SUPPLY UNIT CIRCUIT DIAGRAM (F 60 FM)

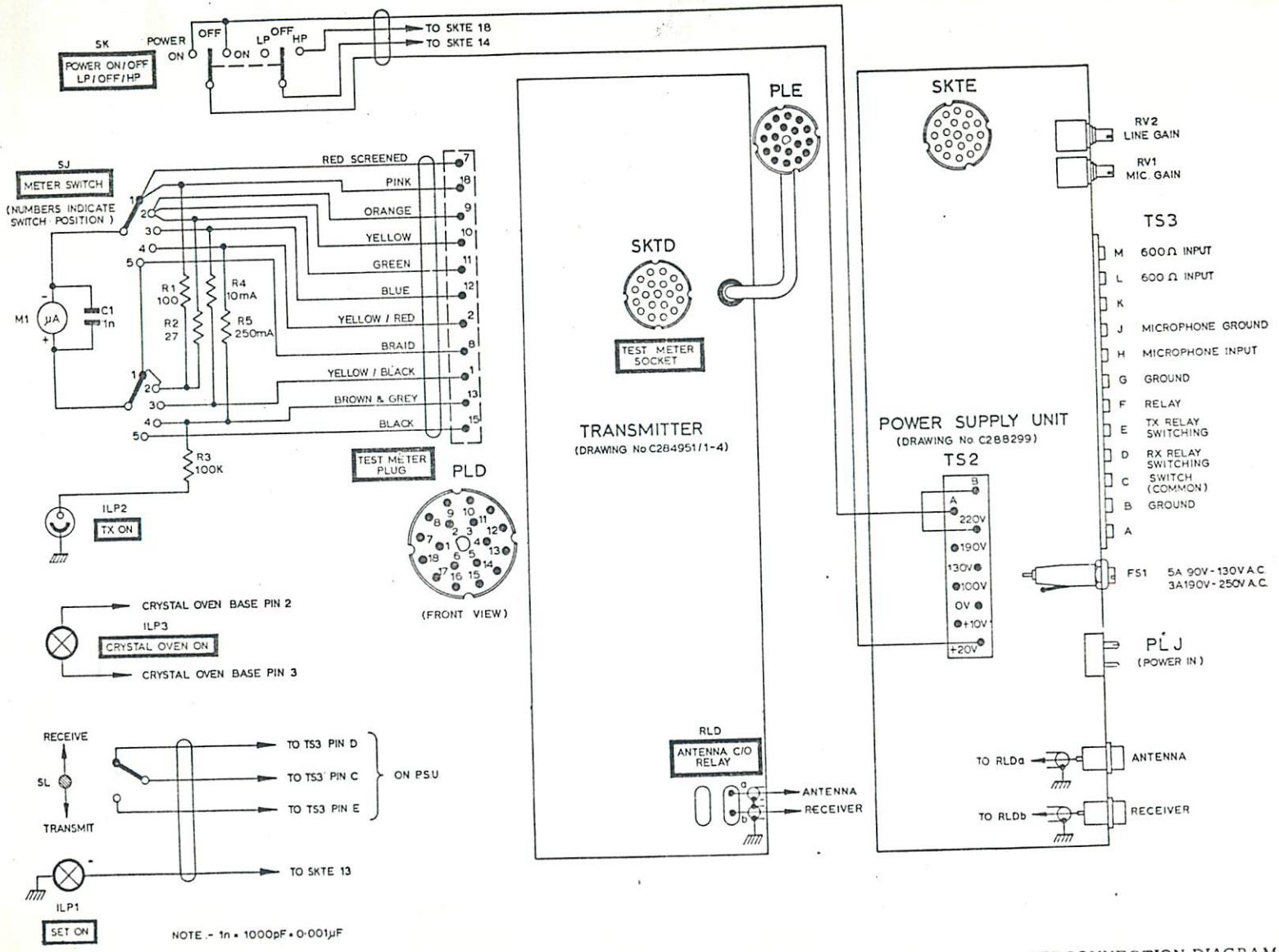


Fig. 21 TRANSMITTER INTERCONNECTION DIAGRAM
(F 60 FM)

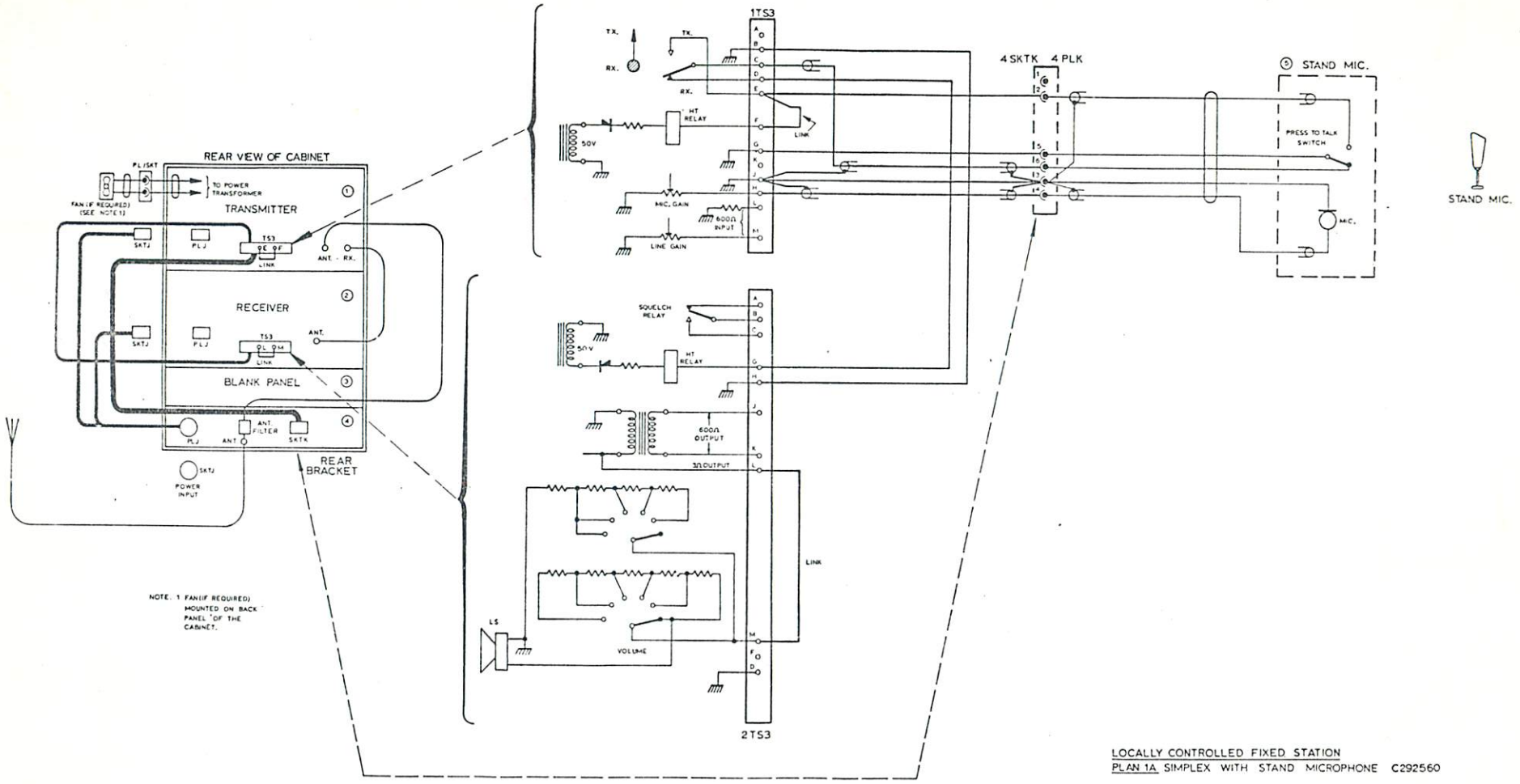


Fig. 22 SIMPLEX FIXED STATION INTERCONNECTION DIAGRAM (F 60 FM)

INTRODUCTION

It is recommended that a trial run through the procedure be carried out prior to aligning the receiver.

EQUIPMENT REQUIRED

1. V.H.F. signal generator (see V.H.F. Signal Generators in Chapter IV)
2. Crystal controlled 455 kc/s marker oscillator (the Pye PT503 is suitable).
3. Pye Test Meter Type TM1.
4. Audio output meter of 30Ω and 600Ω impedance, reading up to 2W (most standard multi-range instruments are suitable).

FIRST LOCAL OSCILLATOR

Under no circumstances should the setting of the crystal trimming inductors L801-L806 be altered without reference to a frequency sub-standard (see Appendix).

ALIGNMENT PROCEDURE

Switched channel equipment should be aligned on the channel nearest to the centre frequency and the performance on the remaining channels checked after alignment. On equipment using two widely spaced channels, compromise tuning of the R.F. Unit must be used to equalise the performance on both channels. Performance figures quoted relate to channels within ±0.2% of the mean carrier frequency.

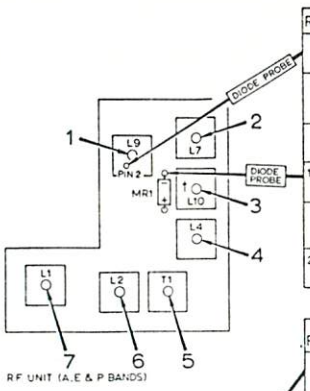
This procedure is for complete receiver re-alignment. When a component affecting alignment is replaced, only the associated printed circuit board need be re-aligned.

Connect the voltmeter across pins 5 and 8 of the Audio Driver Unit and with the a.f. gain control set fully counter clockwise, adjust RV701 for a voltmeter reading of 0.63V, equivalent to 190mA of collector current for the audio amplifier VT702.

1. Connect the audio output meter, set to 30Ω impedance, in parallel with the loudspeaker, connect the signal generator to the antenna connector and set the signal generator frequency to the receiver operating frequency.
2. Connect the 2.5V d.c. voltmeter across the discriminator test points (indicated by red spots) on the Second I.F. Unit.
3. Turn the SQUELCH control fully clockwise and carry out the alignment procedure shown in the chart opposite. The preliminary procedure need be carried out only if the receiver operating frequency is to be changed or if a preliminary alignment of the r.f. circuits is required to obtain a working condition prior to the complete alignment procedure.

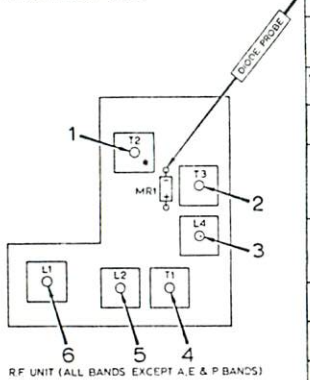
PERFORMANCE CHECKS

1. Check that the 20 dB quieting level is 1.25μV e.m.f. or better.
2. With a signal input of 2μV e.m.f. modulated (±2.5 kc/s deviation for 25 kc/s channel spacing or ±3.5 kc/s deviation for 50 kc/s channel spacing), set the VOLUME control fully clockwise and adjust the a.f. gain control for an audio output of 100mW (10mW on the meter); check that the signal-to-noise ratio is not less than 25 dB for 50 kc/s channel spacing or 22 dB for 25 kc/s channel spacing.
3. Check that the squelch opens on an unmodulated r.f. signal 3 dB below that which gives 20 dB quieting.



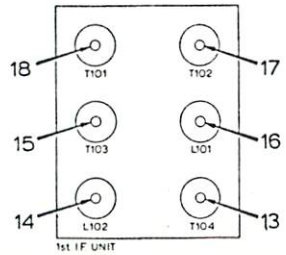
R.F. UNIT (A,E & P BANDS)

REF.	PRELIMINARY PROCEDURE (A,E & P BANDS)
	REMOVE L9 SCREENING CAN (R.F. UNIT)
1	ADJUST FOR MAXIMUM READING ON DIODE PROBE. (R.F. UNIT)
	REPLACE L9 SCREENING CAN (R.F. UNIT)
1&2	ADJUST FOR MAXIMUM READING (R.F. UNIT)
	SWITCH ON SIGNAL GENERATOR AND ADJUST FREQUENCY AND OUTPUT LEVEL TO OBTAIN NOISE QUIETING OF AUDIO OUTPUT
2 to 7	ADJUST IN SEQUENCE FOR MAXIMUM QUIETING (R.F. UNIT)

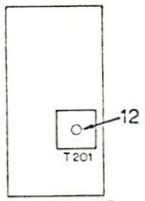


R.F. UNIT (ALL BANDS EXCEPT A,E & P BANDS)

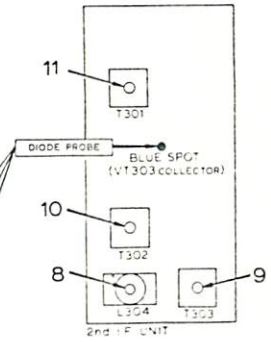
REF.	PRELIMINARY PROCEDURE (ALL BANDS EXCEPT A,E & P)
1	ON 54-174 Mc/s EQUIPMENT ADJUST FOR MAXIMUM READING ON DIODE PROBE (R.F. UNIT)
	SWITCH ON SIGNAL GENERATOR AND ADJUST FREQUENCY AND OUTPUT LEVEL TO OBTAIN NOISE QUIETING OF AUDIO OUTPUT
1 to 6	ADJUST IN SEQUENCE FOR MAXIMUM QUIETING (R.F. UNIT)
	COMPLETE ALIGNMENT PROCEDURE
	SET SIGNAL GENERATOR OUTPUT LEVEL SUFFICIENTLY HIGH TO PRODUCE BEAT NOTE WITH MARKER OSCILLATOR LOOSELY COUPLED TO 455kc/s STAGES OF 2nd I.F. UNIT AND ADJUST SIGNAL GENERATOR FREQUENCY FOR ZERO BEAT
8	INJECT R.F. SIGNAL > 2mV e.m.f. AND ADJUST TO CENTRE OF DISCRIMINATOR CURVE - ZERO READING ON TM1 SWITCHING TO METER +− AND −+ ALTERNATELY (SEE NOTE 2)
	SWITCH OFF SIGNAL GENERATOR AND SET OUTPUT LEVEL CONTROL TO MINIMUM TO AVOID LEAKAGE
9	ADJUST FOR MAXIMUM NOISE AT AUDIO OUTPUT (2nd I.F. UNIT)
10	SHORT CIRCUIT PINS 1 & 6 ON 2nd I.F. UNIT, ADJUST FOR MAXIMUM NOISE AT AUDIO OUTPUT AND REMOVE SHORT CIRCUIT (2nd I.F. UNIT)
	SWITCH ON SIGNAL GENERATOR AND RE-CHECK FOR ZERO BEAT WITH MARKER OSCILLATOR
	ADJUST SIGNAL GENERATOR OUTPUT LEVEL FOR READING OF 0.5V (APPROX.) ON DIODE PROBE DURING SUBSEQUENT ADJUSTMENTS REDUCE SIGNAL GENERATOR OUTPUT LEVEL TO MAINTAIN READING BETWEEN 0.5 AND 1V
11	ADJUST FOR MAXIMUM READING (2nd I.F. UNIT)
12	ADJUST FOR MAXIMUM READING (2nd MIXER UNIT)
13 to 18	ADJUST IN SEQUENCE FOR MAXIMUM READING (1st I.F. UNIT)
	REPEAT REFS. 1 to 6 OR 2 to 7 AS APPROPRIATE



1st I.F. UNIT



2nd MIXER UNIT



2nd I.F. UNIT

* 25-54Mc/s EQUIPMENT – OMIT REF 1, 12 NOT FITTED ON THESE EQUIPMENTS.

† 68-88Mc/s EQUIPMENT – FOR L10 READ T2 (REF 3).
148-174Mc/s EQUIPMENT – WHEN ALIGNMENT IS COMPLETE TUNE C43 FOR MAXIMUM QUIETING.

Fig.23 RECEIVER ALIGNMENT CHART (F 60 FM)

INTRODUCTION

It is recommended that a trial run through the procedure be carried out prior to aligning the transmitter.

EQUIPMENT REQUIRED

1. R.F. power output meter (Bird Termaline Model 612 is suitable).
2. Audio frequency generator.
3. Carrier deviation meter (Marconi Instruments Model TF 791C is suitable).

CRYSTAL OSCILLATOR

Under no circumstances should the crystal trimmers be adjusted without reference to a frequency sub-standard (see Appendix).

R.F. ALIGNMENT PROCEDURE

Switched channel equipment should be aligned on the channel nearest to the centre frequency and the performance on the remaining channels checked after alignment. On equipment using two widely spaced channels, compromise tuning of the transmitter must be used to equalise the performance on both channels. Performance figures quoted relate to channels within ±0.2% of the mean frequency.

Notes: (a) The balancing capacitor 1C50 has been factory aligned for maximum drive consistent with balance, and must not be adjusted unless components affecting balance are changed.

(b) Operate the TRANSMIT switch 2SL only when making adjustments.

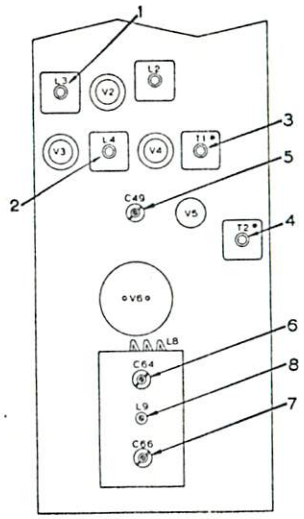
Connect the r.f. power output meter to the antenna connector, set the L.P.-OFF-H.P. switch 2SK to the LP position and carry out the alignment procedure shown in the chart opposite.

A.F. ALIGNMENT PROCEDURE

Notes: (a) This procedure should only be carried out if the modulator valve 1V1 is changed.

(b) Allow at least five minutes for the equipment to warm up prior to making any adjustment.

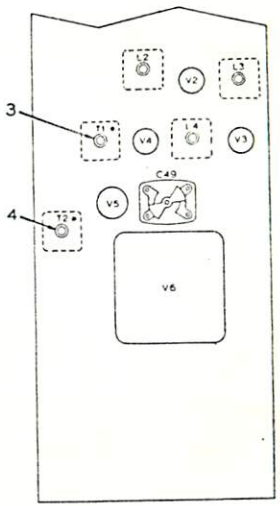
1. Connect the output meter to the antenna connector and the deviation meter to the terminals on the output meter.
2. Set 1RV5 to maximum (fully clockwise)
3. Connect the a.f. generator to terminals J and H of 2TS3, and inject a 1000 c/s signal at a level which will produce 50% of the peak deviation; check that the input is less than 15mV.
4. Raise the level by 20 dB and set 1RV5 to give the required peak deviation (normally 5 kc/s for 25 kc/s channelling or 15 kc/s for 50 kc/s channelling).
5. Reduce the level slowly and if the deviation is found to exceed the required peak value, re-set 1RV5 at the level where peak deviation occurs.



TOP OF CHASSIS

REF	METER SWITCH POSITION	ADJUSTMENT	TYPICAL METER (2M1) READING (μA)	R.F. OUTPUT
		25-68 Mc/s EQUIPMENT		
1	2	ADJUST FOR MAXIMUM (1V2 MULTIPLIER OUTPUT)	250	
		68-174 Mc/s EQUIPMENT		
1	1	ADJUST FOR MAXIMUM (1V2 BUFFER/AMPLIFIER OUTPUT)	250	
2	2	ADJUST FOR MAXIMUM (1V3 MULTIPLIER OUTPUT)	250	
3	2	ADJUST PRIMARY & SECONDARY TOGETHER FOR ABSOLUTE MAXIMUM (1V4 MULTIPLIER OUTPUT)	250	
		25-174 Mc/s EQUIPMENT		
4	2	ADJUST PRIMARY & SECONDARY TOGETHER FOR ABSOLUTE MAXIMUM (1V5a MULTIPLIER OUTPUT)	250	
5	3	ADJUST FOR MAXIMUM (1V5b DRIVER OUTPUT)	300	
6	4	ADJUST FOR MINIMUM (1V6 ANODE CURRENT)		
		SET SWITCH 2SK TO H.P. POSITION		
5	*3	ADJUST FOR MAXIMUM	300	
6	4	ADJUST FOR MINIMUM		
7	4	ADJUST FOR MAXIMUM		
6&8	4	ADJUST REF. 8 FOR MAXIMUM, RE-ADJUSTING REF. 6 FOR MINIMUM AFTER EACH SETTING OF REF. 8 (OPTIMUM ANTENNA COUPLING)		
7	4	ADJUST FOR MAXIMUM (TUNING WILL BE FOUND BROAD)		
8	4	ADJUST FOR MAXIMUM IN POWER OUTPUT METER OR 2M1, WHICHEVER OCCURS FIRST	260-280 (MAX) OR 450-480 (MAX)	25W (MIN) 60W (MIN)

* ONE CORE ADJUSTABLE FROM TOP AND ONE CORE ADJUSTABLE FROM BELOW CHASSIS



UNDERSIDE OF CHASSIS

Fig. 24 TRANSMITTER ALIGNMENT CHART (F 60 FM)